New Hampshire Volunteer River Assessment Program

1999

SOUCOOK RIVER

Water Quality Report

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

March 2003

NHDES-R-WD-03-17

STATE OF NEW HAMPSHIRE

Volunteer River Assessment Program

1999

SOUCOOK RIVER

Water Quality Report

STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
6 HAZEN DRIVE
CONCORD, N.H. 03301

ROBERT MONACO
ACTING COMMISSIONER

HARRY T. STEWART
DIRECTOR
WATER DIVISION

Prepared by:
Beth L. Malcolm, VRAP Coordinator

March 2003

Printed on Recycled Paper

TABLE OF CONTENTS

Cover Photographs: Volunteers testing water quality in the Soucook River

1. ACKNOWLEDGEMENTS

The New Hampshire Department of Environmental Services-Volunteer River Assessment Program extends sincere thanks to the volunteers of the Soucook Watershed Water Quality Program during 1999. This report was created solely from the data collected by the volunteers listed, below. It is their time and dedication that not only contributes to the amount of knowledge of rivers and streams in New Hampshire, but also expresses the genuine concern for local water resources.

Arnie Alpert
Sandra Blanchard
Barbara Cameron
Vicki Chase
Judy Elliott
Edward Epp
Muriel Ford
Chris George
Hillary Nelson
Kendall Perkins
Nancy Stearns

Coordinator:
Kendall Perkins

2. VOLUNTEER RIVER ASSESSMENT PROGRAM OVERVIEW

The Volunteer River Assessment Program (VRAP) supports watershed organizations in their efforts to monitor river water quality. The primary focus of VRAP is to provide volunteers with river monitoring guidelines, equipment loans, and technical training. DES also incorporates applicable volunteer monitoring results into its evaluation of New Hampshire surface waters. Annual reports for each VRAP river include a summary of monitoring results and recommendations for future water quality sampling. VRAP aims to foster public understanding and stewardship of river systems and to increase available water quality information about New Hampshire rivers and streams.

VRAP loans and maintains water monitoring kits that include meters and supplies for on-station measurement of five basic water quality parameters: water temperature, dissolved oxygen, pH, specific conductance (conductivity), and turbidity. The investigation of these and additional parameters such as nutrients, metals, and *E. coli* is conducted by state water quality personnel and may be augmented by volunteer sampling. Sampling additional parameters comes with the cost of analysis, which can be covered by an assortment of fundraising activities such as association membership fees, special events, and in-kind services (non-monetary contributions from individuals and organizations), and grant writing.

Water quality measurements repeated over time create a picture of the fluctuating conditions in rivers and streams and help to determine where improvements, restoration or preservation may benefit the river and the communities it supports. Water quality results are also used to determine if a river is meeting surface water quality standards. Volunteer monitoring results meeting DES Quality Assurance and Quality Control (QA/QC) requirements supplement the efforts of DES to assess the condition of New Hampshire surface waters. The New Hampshire Surface Water Quality Regulations are available through the DES Public Information Center at www.des.state.nh.us/wmb/Env-Ws1700.pdf or (603) 271-1975.

VRAP typically recommends sampling every other week during the summer, and citizen monitoring groups are encouraged to organize a long-term sampling program in order to begin to determine trends in river conditions. Each year volunteers arrange a sampling schedule and design in cooperation with the VRAP Coordinator. Project designs are created through a review and discussion of existing water quality information, such as known and perceived problem areas or locations of exceptional water quality. The interests, priorities, and resources of the partnership determine monitoring locations, parameters, and frequency.

Each VRAP volunteer must attend an annual training session to receive a demonstration of monitoring protocols and sampling techniques. Training sessions are an opportunity for volunteers to come together and receive an updated version of monitoring techniques. Training sessions are typically conducted outdoors near surface waters for an interactive demonstration. During the training volunteers have a chance to practice using the VRAP equipment and may also receive instruction in the collection of samples for laboratory

analysis. Training is accomplished in approximately three hours, after which volunteers are certified in the care, calibration, and use of the VRAP equipment.

VRAP groups conduct sampling according to a prearranged monitoring schedule and VRAP protocols. VRAP aims to visit volunteers during scheduled sampling events to verify that volunteers successfully follow the VRAP protocols. If necessary, volunteers are re-trained during the visit, and the group's monitoring coordinator is notified of the result of the verification visit. Volunteer organizations forward water quality results to the VRAP Coordinator for incorporation into an annual report and state water quality assessment activities.

Applicable volunteer data are input to a water quality database, and considered (along with other reliable sources of data) during periodic DES water quality assessments. Assessment results and the methodology used to assess surface waters are published by DES every two years (i.e., Section 305(b) Water Quality Reports) as required by the federal Clean Water Act.

3. PROJECT SUMMARY: SOUCOOK RIVER VRAP

In 1999, the volunteers of the Soucook Watershed Water Quality Program became interested in exploring water quality in the Soucook River and its tributaries. Water quality sampling was conducted from May 21 through September 18 at eight stations along the main stem and sixteen stations along tributaries of the Soucook River from its upper limits in Canterbury and Gilmanton to its confluence with the Merrimack River in Pembroke. Appendix A lists the stations included in the sampling program. Since 1999, DES has changed many of the names and IDs of the stations monitored in 1999. This was done to more accurately reflect the location of each station in the watershed. These changes are noted in Appendix A along with the names originally used in 1999. Water quality parameters included dissolved oxygen, temperature, pH, turbidity, and conductivity. A map of each sampling location is included in the Results and Discussion section of this report.

4. RESULTS, DISCUSSION, AND RECOMMENDATIONS

This section includes a description of the Soucook River VRAP 1999 monitoring locations and results, a discussion of the results in comparison with New Hampshire water quality standards, and recommendations for future sampling and watershed investigations. A map is included for each station. Results are presented in graphs and text prepared by the VRAP, and tables including all monitoring results from each station are located in Appendix B. The discussion of the results includes recommendations for future sampling and investigations that will contribute to the assessment of water quality conditions.

The water quality information collected at each station is summarized in a table that provides the reader with an overview of the monitoring activities and results. The table can be used as a quick reference for the reader; results not meeting state water quality

criteria do not necessarily indicate a violation of water quality standards. The summary table indicates: (1) the number and type of samples collected, (2) the number of samples collected according to quality assurance and quality control requirements, (3) the number of samples not meeting state water quality criteria, (4) the range of the measurements, and (5) abbreviated water quality standards.

The presentation and discussion of the volunteer results focuses primarily on two parameters: DO and pH. These parameters are the core of the VRAP monitoring system, and have relatively straightforward standards that lend themselves to the assessment of individual results. These results can contribute directly to the determination of fishable and swimmable river and stream conditions, which is often a primary volunteer monitoring goal. Graphs of dissolved oxygen (DO) concentrations and water temperature are included in the discussion, and aide the reader in understanding the results. Appendix C provides descriptions of the water quality parameters analyzed under VRAP during 1999 and the associated New Hampshire surface water quality standards (SWQS) for Class B waters.

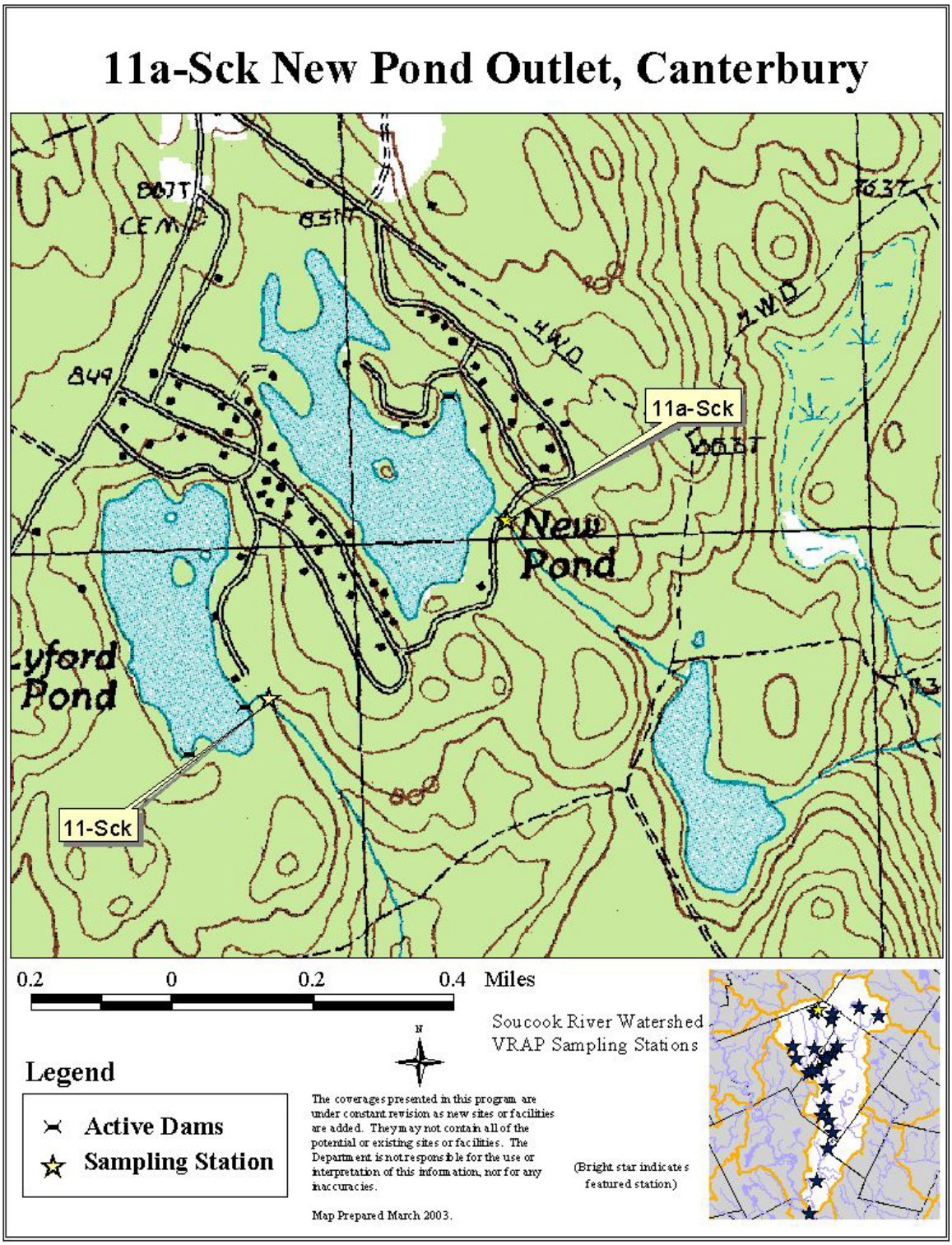
The reader should note that discussion is limited to those parameters at each station that do not meet state criteria, or where more data are necessary. For example, since pH measurements exceeded state standards on five out of six samples at 11a-Sck, pH will be discussed in detail. However, recommendations are not limited to parameters with results that fall outside state criteria.

VRAP aims to provide a mechanism for citizens to contribute to the ongoing process of surface water quality assessment. Recommendations for future monitoring activities and watershed investigations are included in this report following the results and discussion. Also included are recommendations for improvements in sampling techniques to encourage volunteers to adhere to quality assurance and control measures.

Volunteers are encouraged to sample their rivers and streams on a long-term basis. Much of the information volunteers collect profiles river and stream locations for the first time. Several years (e.g., five to ten) of good quality measurements will be needed to begin to decipher water quality trends and the status of rivers and streams relative to the New Hampshire surface water quality standards. Water quality data for the stretch of river sampled by volunteers are presented in graphs in Appendix D. These graphs are included in the report to show how water quality conditions change from upstream to downstream. The current report format will describe water quality conditions on a station-by-station basis.

All results generated by the Soucook River VRAP 1999 were collected using the VRAP Field Datasheet and Field Sampling Protocols, 1999 (see Appendix E).

4.1. 11a-Sck: New Pond Outlet, Canterbury, NH



4.1.1. Results and Discussion

Six measurements were made in the field for dissolved oxygen (DO), pH, and turbidity, and five measurements for conductivity using handheld meters (Table 1). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Five pH measurements were below the Class B water quality standards.

Table 1. Monitoring Summary: 11a-Sck. VRAP, 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	6	6	0	7.28 - 8.52	**>5**
DO (% sat.)	6	6	0	78.6 - 87.8	**>75**
pH (Std. Units)	6	6	5	5.43 - 6.57	**6.5-8.0**
Turbidity (NTU)	6	6	0	0.4 - 4.9	**<10 above background**
Conductivity (μmho/cm)	5	5	NA	30 - 42	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.1.1.1. Dissolved Oxygen

Figure 1 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. Although volunteer results revealed adequate DO concentration and saturation, the samples collected by volunteers may not reflect the lowest DO levels reached in the river at this location.

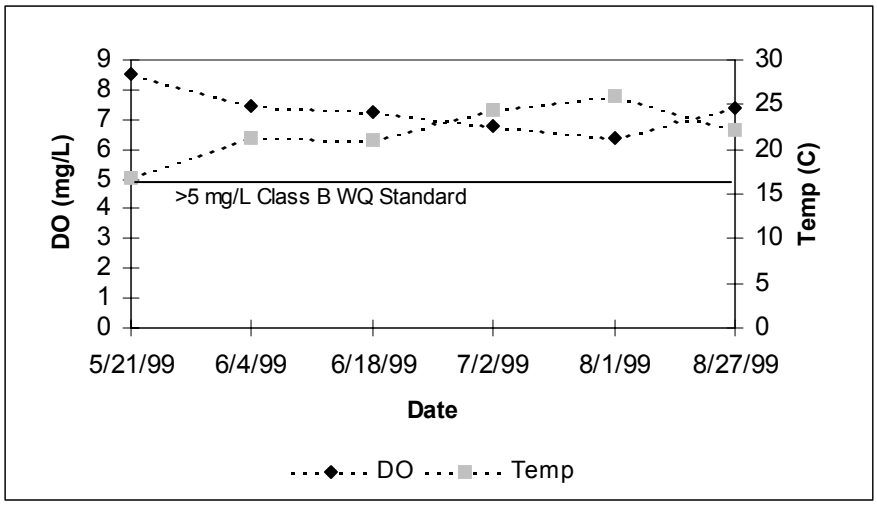


Figure 1. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 11a-Sck, New Pond Outlet, Canterbury, NH. VRAP, 1999.

4.1.1.2. pH

The pH at this location, ranging from 5.43 to 6.57, was measured below the state standard on five of six samples. The precision of the VRAP pH meters (+/- 0.02) requires that results within 0.02 of the standard range (6.5 to 8.0) are not considered out of range. For example, a reading of 6.48 is considered within range, while a reading of 6.47 falls below the standard range.

Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.1.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

- *Dissolved Oxygen*: Measurements should continually be made at this station on a routine basis. This will help document variations in the river, and provide early detection of changes in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. It is likely that pH conditions in New Pond are the primary influence on pH conditions at this site. Volunteers may want to contact DES's Volunteer Lake Assessment Program to see if pH data has been collected for New Pond. In addition, volunteers could walk around the area looking for additional wetland drainage upstream from the site and test for pH. Topographic and GIS (Geographic Information Systems) maps may also provide useful information about drainage patterns in the immediate watershed area.

4.2. 11-Sck: Lyford Pond Outlet, Canterbury, NH

4.2.1. Results and Discussion

Six measurements were made in the field for dissolved oxygen (DO), pH, and turbidity, and five measurements for conductivity using handheld meters (Table 2). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Five pH measurements were below the Class B water quality standards.

Table 2. Monitoring Summary: 11-Sck. VRAP, 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	6	6	0	6.59 - 8.87	**>5**
DO (% sat.)	6	6	0	80.8 - 90.5	**>75**
pH (Std. Units)	6	6	5	5.94 - 6.72	**6.5-8.0**
Turbidity (NTU)	6	6	0	0.47 - 5.8	**<10 above background**
Conductivity (μmho/cm)	5	5	NA	35 - 50	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.2.1.1. Dissolved Oxygen

Figure 2 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. Although volunteer results revealed adequate DO concentration and saturation, the samples collected by volunteers may not reflect the lowest DO levels reached in the river at this location.

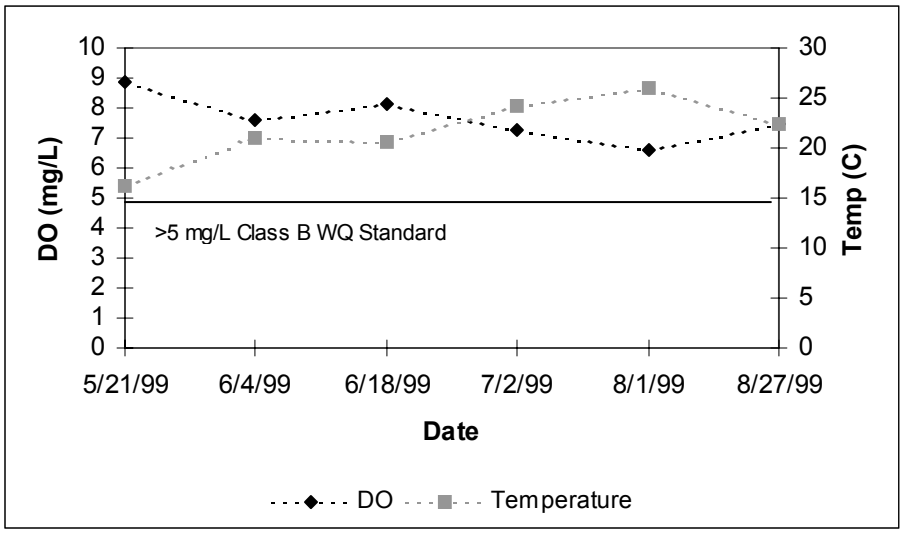


Figure 2. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 11-Sck, Lyford Pond Outlet, Canterbury, NH. VRAP, 1999.

4.2.1.2. pH

The pH at this location, ranging from 5.94 to 6.72, was measured below the state standard on five of six monitoring dates. The precision of the VRAP pH meters (+/- 0.02) requires that results within 0.02 of the standard range (6.5 to 8.0) are not considered out of range. For example, a reading of 6.48 is considered within range, while a reading of 6.47 falls below the standard range.

Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.2.2. Recommendations

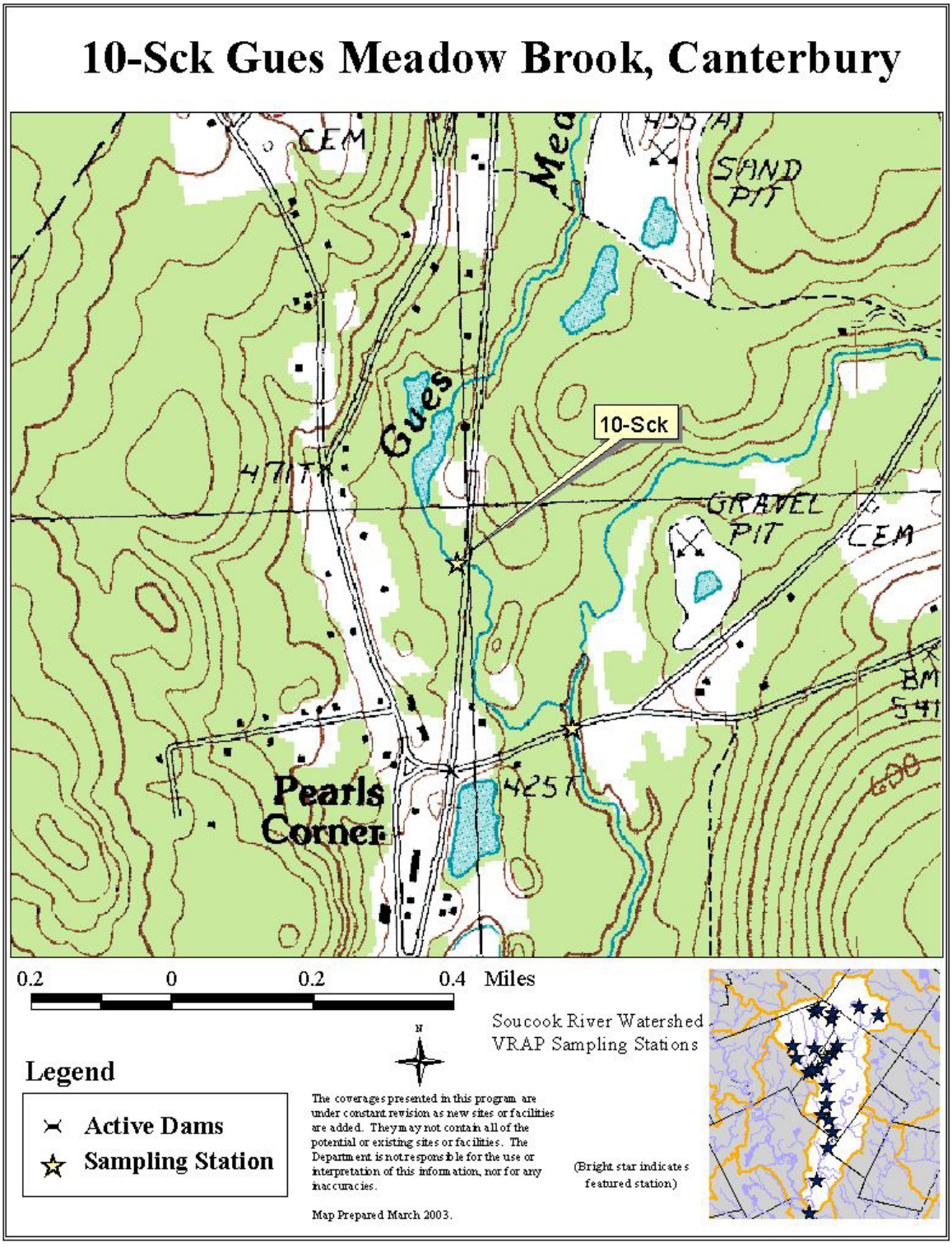
- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

pH: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. It is likely that pH conditions in Lyford Pond are the primary influence on pH conditions at this site. Volunteers may want to contact DES's Volunteer Lake Assessment Program to see if pH data has been collected for Lyford Pond. In addition, volunteers could walk around the area looking for additional wetland drainage upstream from the site and test for pH. Topographic and Geographic Information System (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

- *Dissolved Oxygen*: Measurements should continually be made at this station on a routine basis. This will help document variations in the river, and provide early detection of changes in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.3. 10-Sck: Gues Meadow Brook, Canterbury, NH



4.3.1. Results and Discussion

Seven measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 3). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Three pH measurements were below the Class B water quality standards. Two measurements for DO % saturation were lower than 75%, and two for DO concentration were below 5.0 mg/L. This indicates a potential DO and pH problem at this site. One turbidity reading may be above the Class B water quality standard.

Table 3. Monitoring Summary: 10-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	7	7	2	3.12 - 9.21	**>5**
DO (% sat.)	7	7	2	33.6 - 89.9	**>75**
pH (Std. Units)	7	7	3	5.86 - 6.71	**6.5-8.0**
Turbidity (NTU)	7	7	1	0.8 - 18	**<10 above background**
Conductivity (µmho/cm)	7	7	NA	33 - 125.7	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.3.1.1. Dissolved Oxygen

Dissolved oxygen concentrations in the river at 10-Sck were, on two occasions, less than the minimum instantaneous concentration of 5 mg/L (see Figure 3). The Class B New Hampshire surface water quality standard for DO is a minimum concentration of 5.0 mg/L **and** minimum daily average saturation of 75%. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. However, the low DO concentrations suggest a possible problem, or may be the result of natural conditions (e.g., the presence of wetlands or stagnant water caused by a beaver dam). An accurate determination of whether the DO standard is met for % saturation can only be done using multiple measurements of saturation collected during any single day. Additional sampling and a thorough description of this station are necessary to determine the extent of the potential problem.

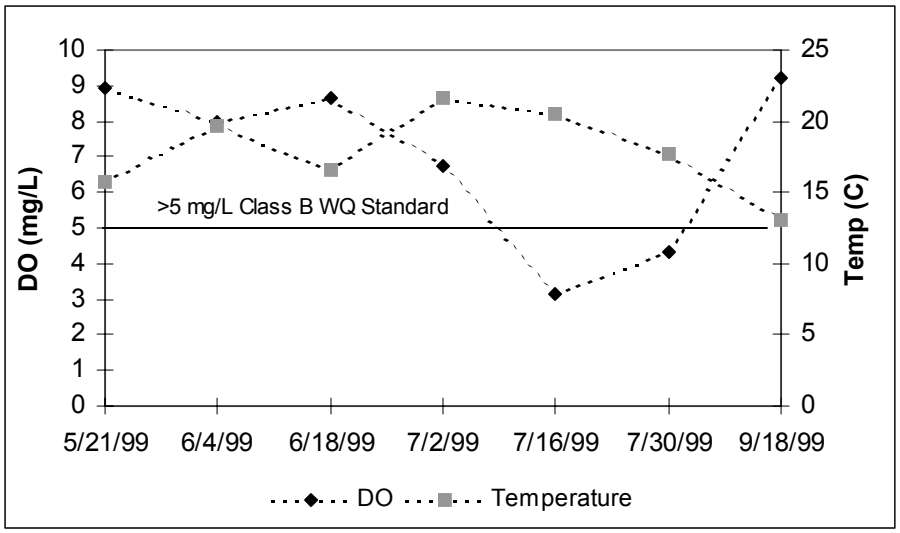


Figure 3. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 10-Sck, Gues Meadow Brook, Canterbury, NH. VRAP, 1999.

4.3.1.2. pH

The pH at this location, ranging from 5.86 to 6.71, was measured below the state standard on three of seven monitoring dates. The precision of the VRAP pH meters (+/- 0.02) requires that results within 0.02 of the standard range (6.5 to 8.0) are not considered out of range. For example, a reading of 6.48 is considered within range, while a reading of 6.47 falls below the standard range.

Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.3.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

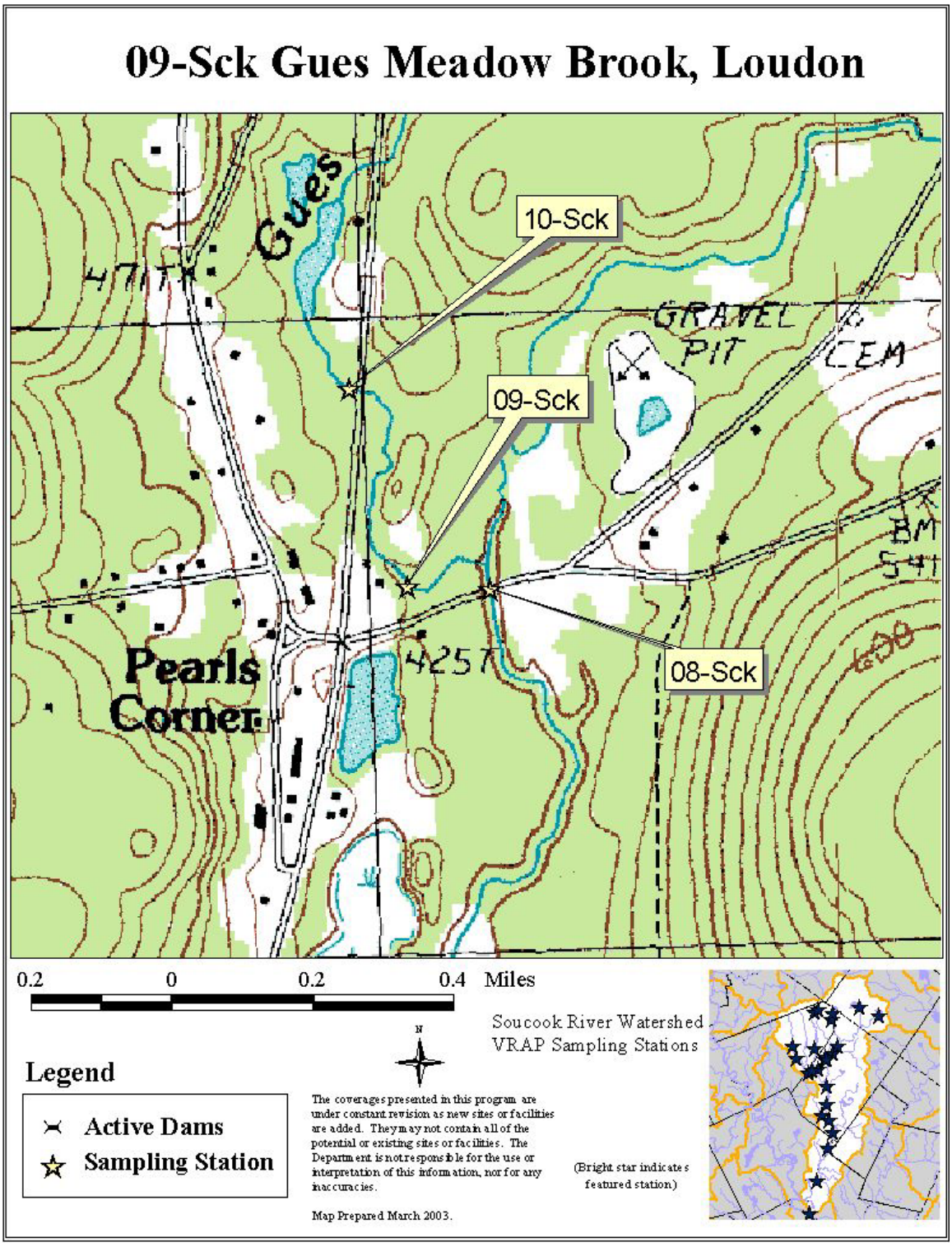
- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

  Phase I:
  As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and GIS (Geographic Information Systems) maps may also provide useful information about drainage patterns in the immediate watershed area.

  Phase II:
  If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen*: Measurements should continually be made at this station on a routine basis. This will help document variations in the river, and track the current potential problem that occurred during August. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.4. 09-Sck: Gues Meadow Brook, Route 106, Loudon, NH



4.4.1. Results and Discussion

Nine measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 4). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Three pH measurements were below the Class B water quality standard.

Table 4. Monitoring Summary: 09-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	9	9	0	7.95 - 11.16	**>5**
DO (% sat.)	9	9	0	86.1 - 123.7	**>75**
pH (Std. Units)	9	9	3	5.79 - 7.04	**6.5-8.0**
Turbidity (NTU)	9	9	0	1.5 - 4.3	**<10 above background**
Conductivity (μmho/cm)	9	9	NA	31 - 141.5	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.4.1.1. Dissolved Oxygen

Figure 4 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards.

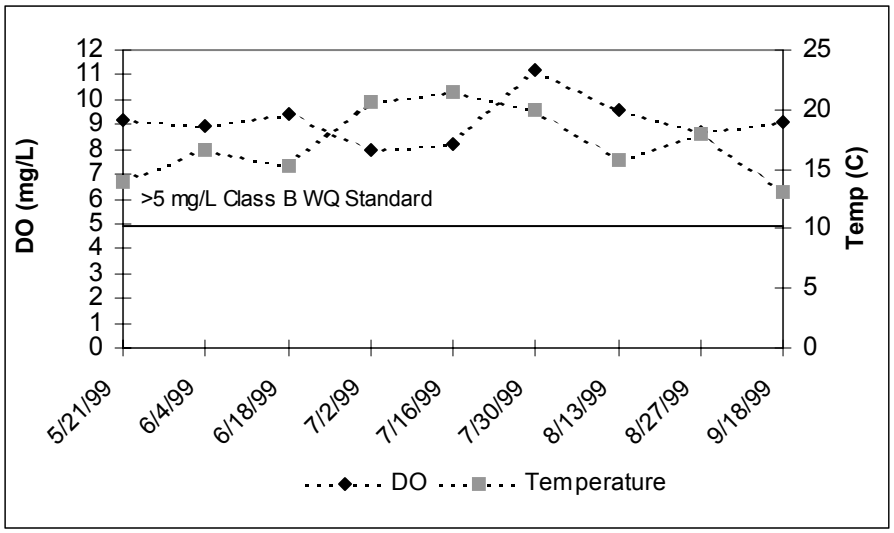


Figure 4. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 09-Sck, Gues Meadow Brook Route 106, Loudon, NH. VRAP, 1999.

4.4.1.2. pH

The pH at this location, ranging from 5.79 – 7.04, was measured below the state standard range on three of nine monitoring dates. The precision of the VRAP pH meters (+/- 0.02) requires that results within 0.02 of the standard range (6.5 to 8.0) are not considered out of range. For example, a reading of 6.48 is considered within range, while a reading of 6.47 falls below the standard range.

Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.4.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

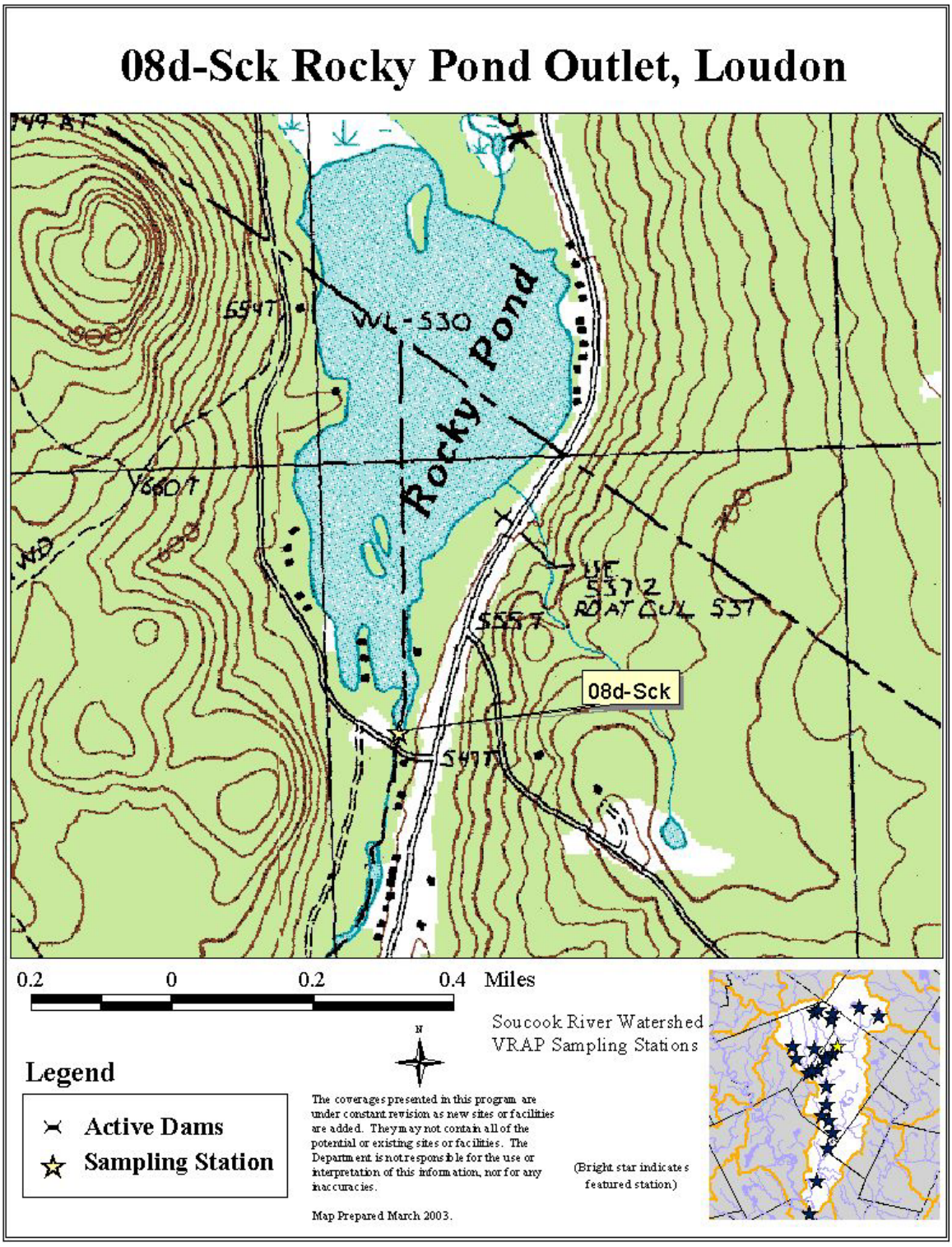
- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

  Phase I:
  As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and GIS (Geographic Information Systems) maps may also provide useful information about drainage patterns in the immediate watershed area.

  Phase II:
  If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen*: Measurements should continually be made at this station on a routine basis. This will help document variations in the river, and track the current potential problem that occurred during August. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.5. 08d-Sck: Rocky Pond Outlet, Loudon, NH



4.5.1. Results and Discussion

Nine measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 5). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Four pH measurements were below the Class B water quality standards. One measurement for DO % saturation was lower than 75%, but this does not necessarily indicate a DO problem.

Table 5. Monitoring Summary: 08d-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	9	9	0	6.27 - 7.95	**>5**
DO (% sat.)	9	9	1	74.3 - 94.6	**>75**
pH (Std. Units)	9	9	4	6.34 - 7.01	**6.5-8.0**
Turbidity (NTU)	9	9	0	0.35 - 3.2	**<10 above background**
Conductivity (μmho/cm)	9	9	NA	73 - 98	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.5.1.1. Dissolved Oxygen

Figure 5 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards.

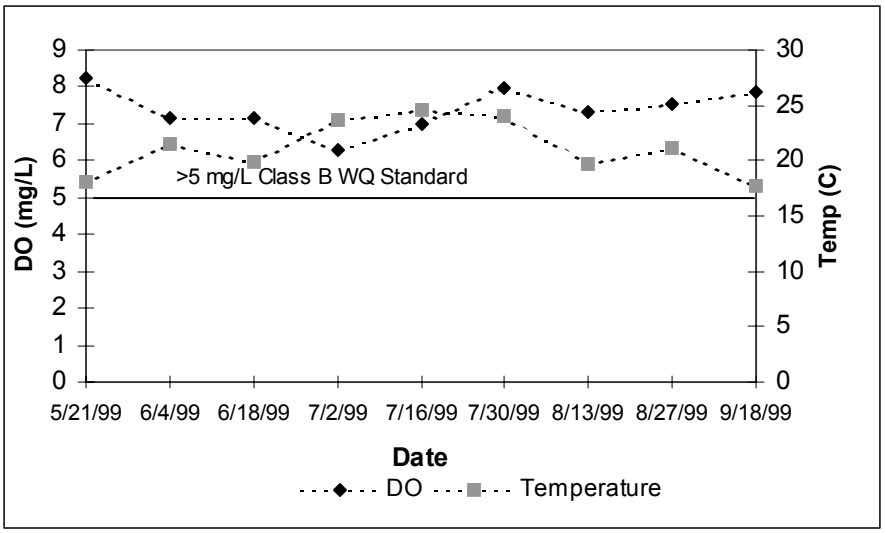


Figure 5. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 08d-Sck, Rocky Pond Outlet, Loudon, NH. VRAP, 1999.

4.5.1.2. pH

The pH at this location, ranging from 6.34 to 7.01, was measured below the state standard on four of nine monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.5.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

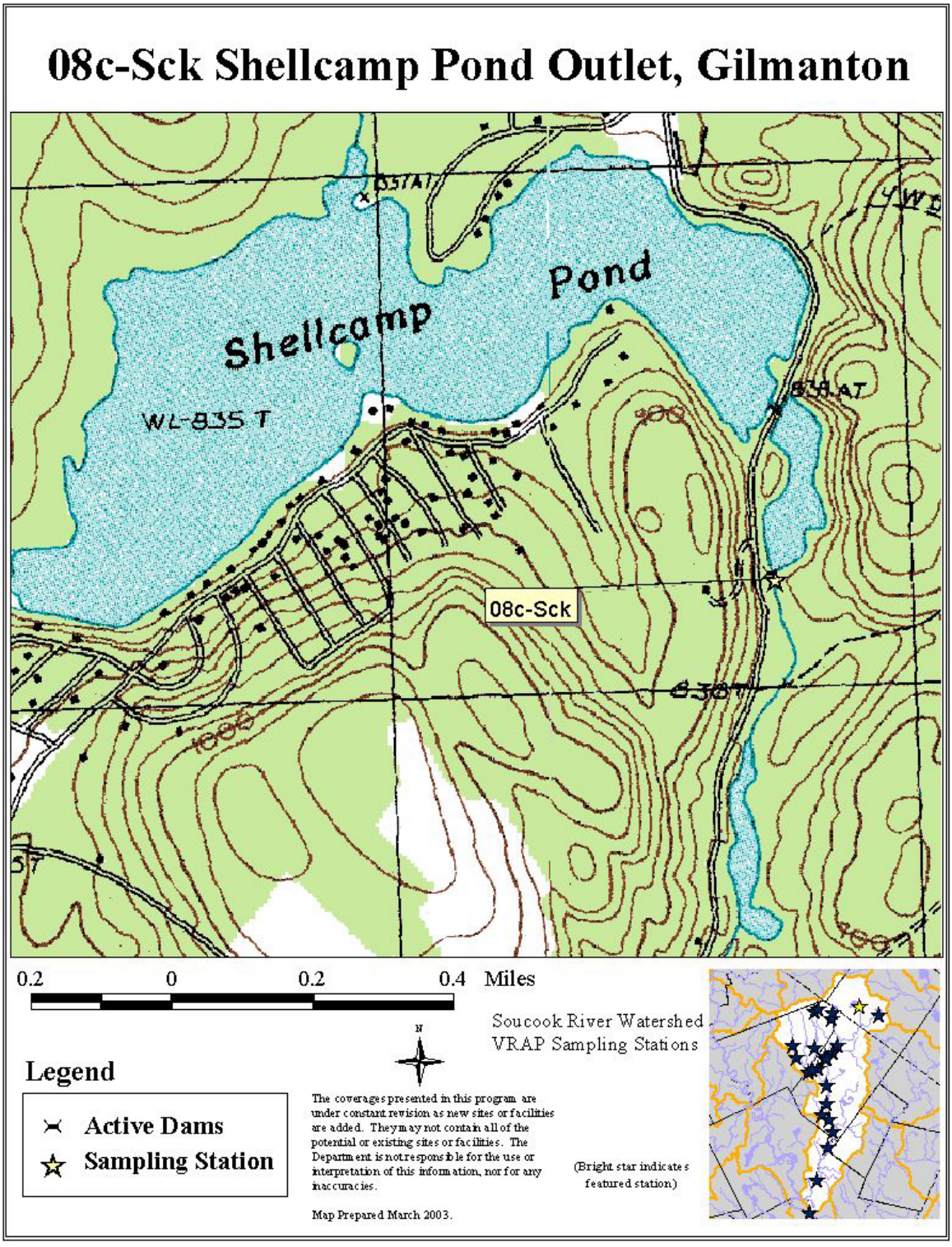
  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. It is likely that pH conditions in Rocky

Pond are the primary influence on pH conditions at this site. Volunteers may want to contact DES's Volunteer Lake Assessment Program to see if pH data has been collected for Rocky Pond. In addition, volunteers could walk around the area looking for additional wetland drainage upstream from the site and test for pH. Topographic and Geographic Information System (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

- *Dissolved Oxygen*: Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.6. 08c-Sck: Shellcamp Pond Outlet, Gilmanton, NH



4.6.1. Results and Discussion

Nine measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 6). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. One pH measurement was below the Class B water quality standards.

Table 6. Monitoring Summary: 08c-Sck. VRAP, 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	9	9	0	7.04 - 8.33	**>5**
DO (% sat.)	9	9	0	77.5 - 91.6	**>75**
pH (Std. Units)	9	9	1	5.99 - 7.02	**6.5-8.0**
Turbidity (NTU)	9	9	0	0.45 - 2.2	**<10 above background**
Conductivity (μmho/cm)	9	9	NA	90 - 129.9	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.6.1.1. Dissolved Oxygen

Figure 6 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards.

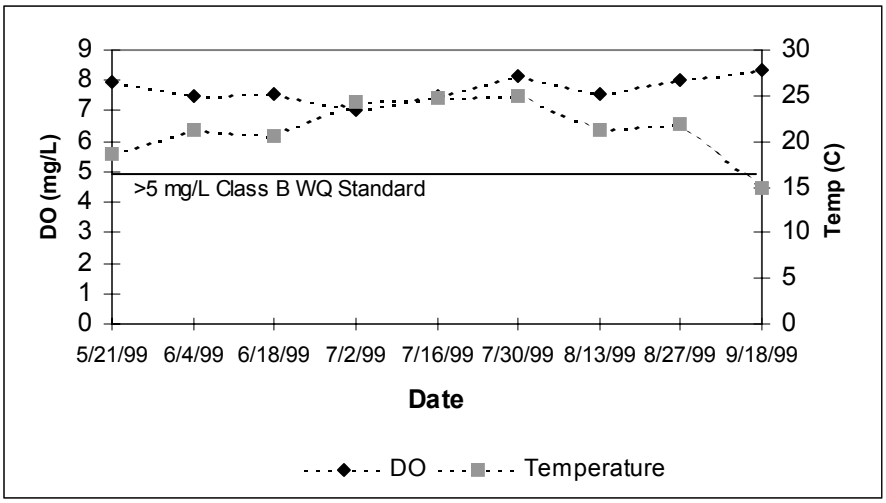


Figure 6. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 08c-Sck, Shellcamp Pond Outlet, Gilmanton, NH. VRAP, 1999.

4.6.1.2. pH

The pH at this location, ranging from 5.99 to 7.02, was measured below the state standard on one of nine monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.6.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

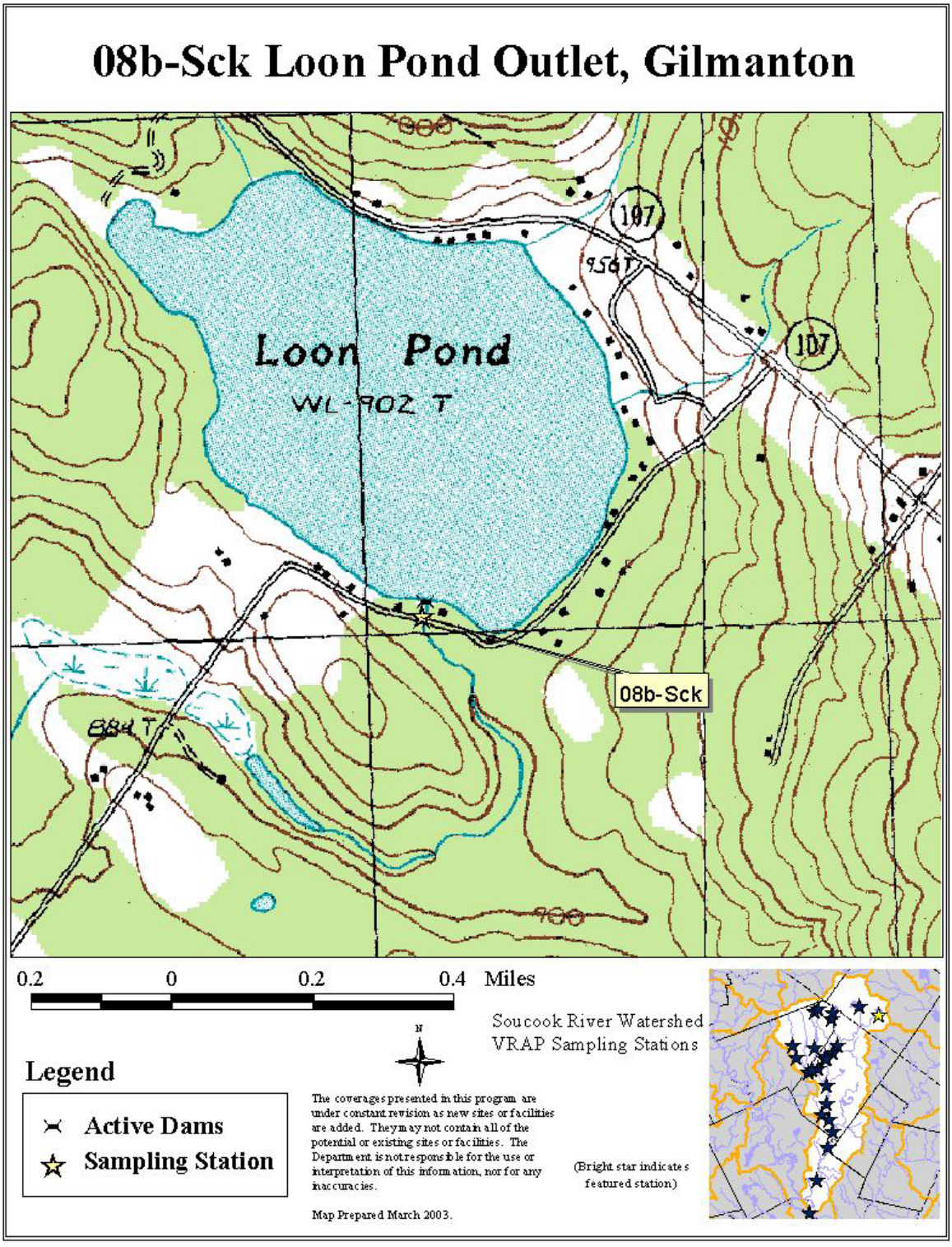
  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. It is likely that pH conditions in Shellcamp Pond are the primary influence on pH conditions at this site. Volunteers may

want to contact DES's Volunteer Lake Assessment Program to see if pH data has been collected for Shellcamp Pond. In addition, volunteers could walk around the area looking for additional wetland drainage upstream from the site and test for pH. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.7. 08b-Sck: Loon Pond Outlet, Gilmanton, NH



4.7.1. Results and Discussion

Nine measurements were made in the field for dissolved oxygen (DO), turbidity, pH, and conductivity (Table 7). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Three pH measurements were below the Class B water quality standards.

Table 7. Monitoring Summary: 08b-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	9	9	0	7.17 - 9.44	**>5**
DO (% sat.)	9	9	0	85.1 - 105.7	**>75**
pH (Std. Units)	9	9	3	6.42 - 7.23	**6.5-8.0**
Turbidity (NTU)	9	9	0	0.2 - 2.7	**<10 above background**
Conductivity (μmho/cm)	9	9	NA	71 - 95	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.7.1.1. Dissolved Oxygen

Figure 7 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards.

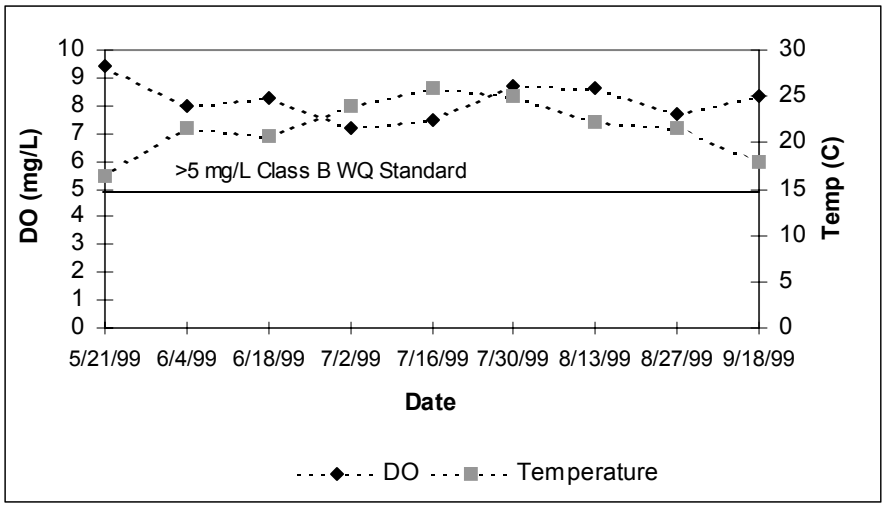


Figure 7. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 08b-Sck, Loon Pond Outlet, Gilmanton, NH. VRAP, 1999.

4.7.1.2. pH

The pH at this location, ranging from 6.42 to 7.23, was measured below the state standard on three of nine samples taken. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.7.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

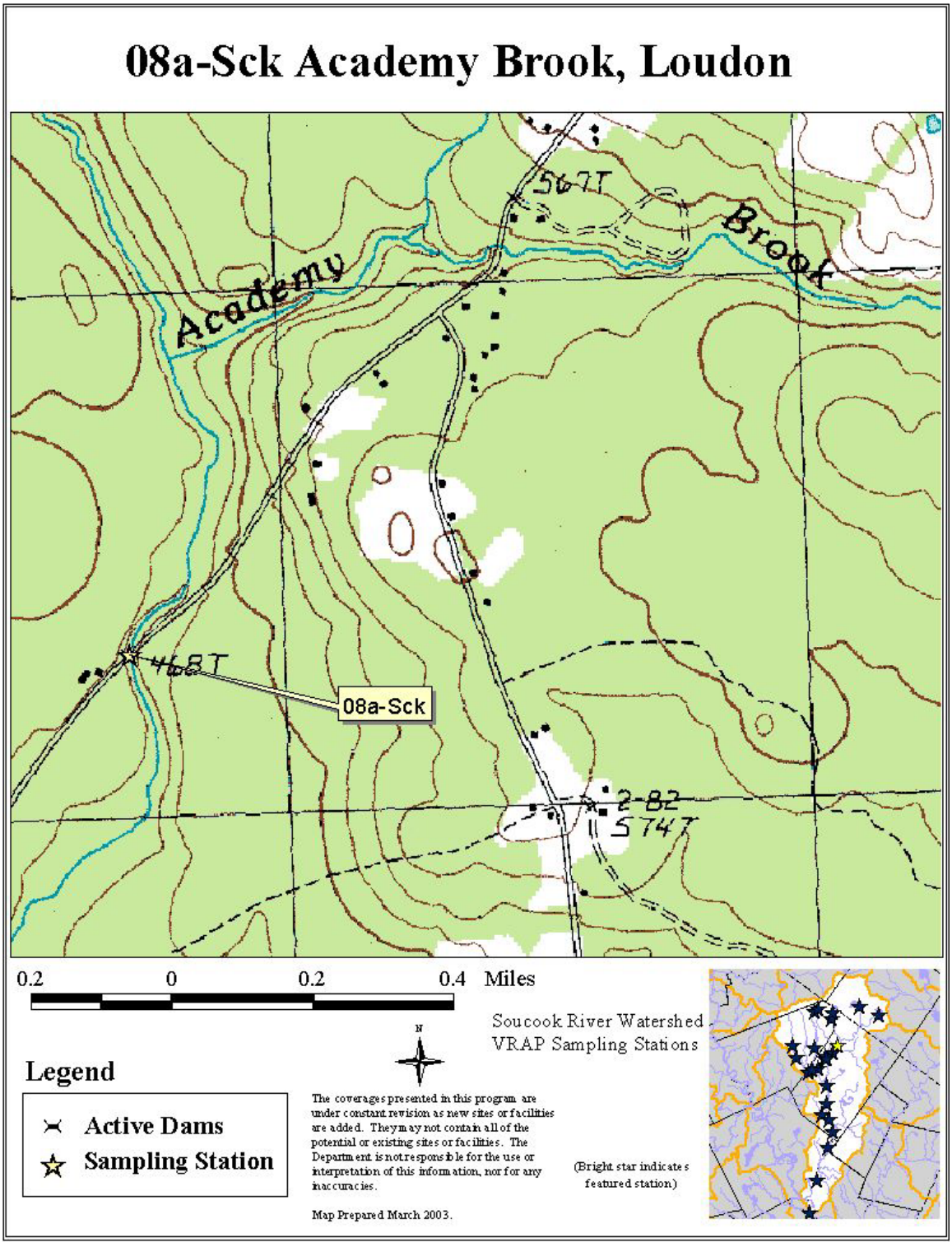
  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. As a first response to low pH measurements, volunteers can investigate the immediate drainage area to

determine patterns of runoff and flow. It is likely that pH conditions in Loon Pond are the primary influence on pH conditions at this site. Volunteers may want to contact DES's Volunteer Lake Assessment Program to see if pH data has been collected for Loon Pond. In addition, volunteers could walk around the area looking for additional wetland drainage upstream from the site and test for pH. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.8. 08a-Sck: Academy Brook, Loudon, NH



4.8.1. Results and Discussion

Nine measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 8). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Four pH measurements were below the Class B water quality standards.

Table 8. Monitoring Summary: 08a-Sck. VRAP, 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	9	9	0	7.91 - 10.33	**>5**
DO (% sat.)	9	9	0	88.5 - 116.3	**>75**
pH (Std. Units)	9	9	4	6.26 - 7.31	**6.5-8.0**
Turbidity (NTU)	9	9	0	0.6 - 2.0	**<10 above background**
Conductivity (μmho/cm)	9	9	NA	49 - 99	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.8.1.1. Dissolved Oxygen

Figure 8 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75% of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards.

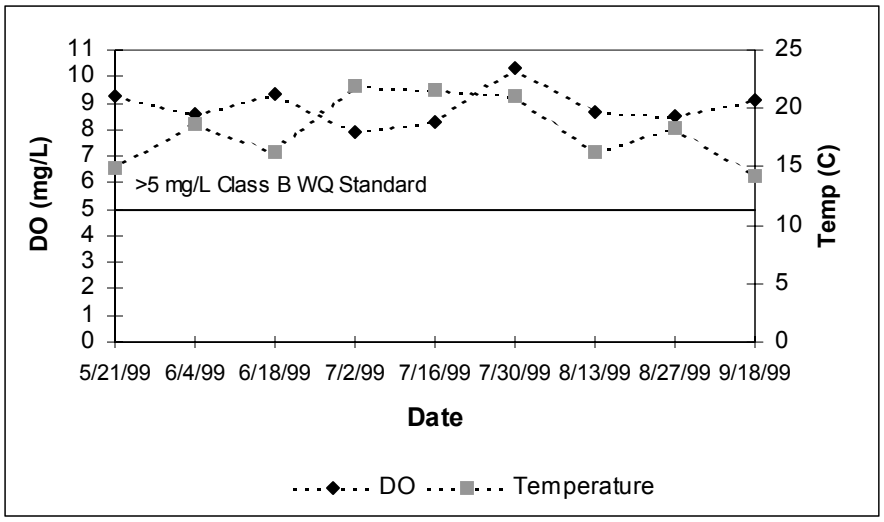


Figure 8. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 8a-Sck-Cch, Academy Brook, Loudon, NH. VRAP, 1999.

4.8.1.2. pH

The pH at this location, ranging from 6.26 to 7.31, was measured below the state standard for four of nine samples taken. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.8.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the

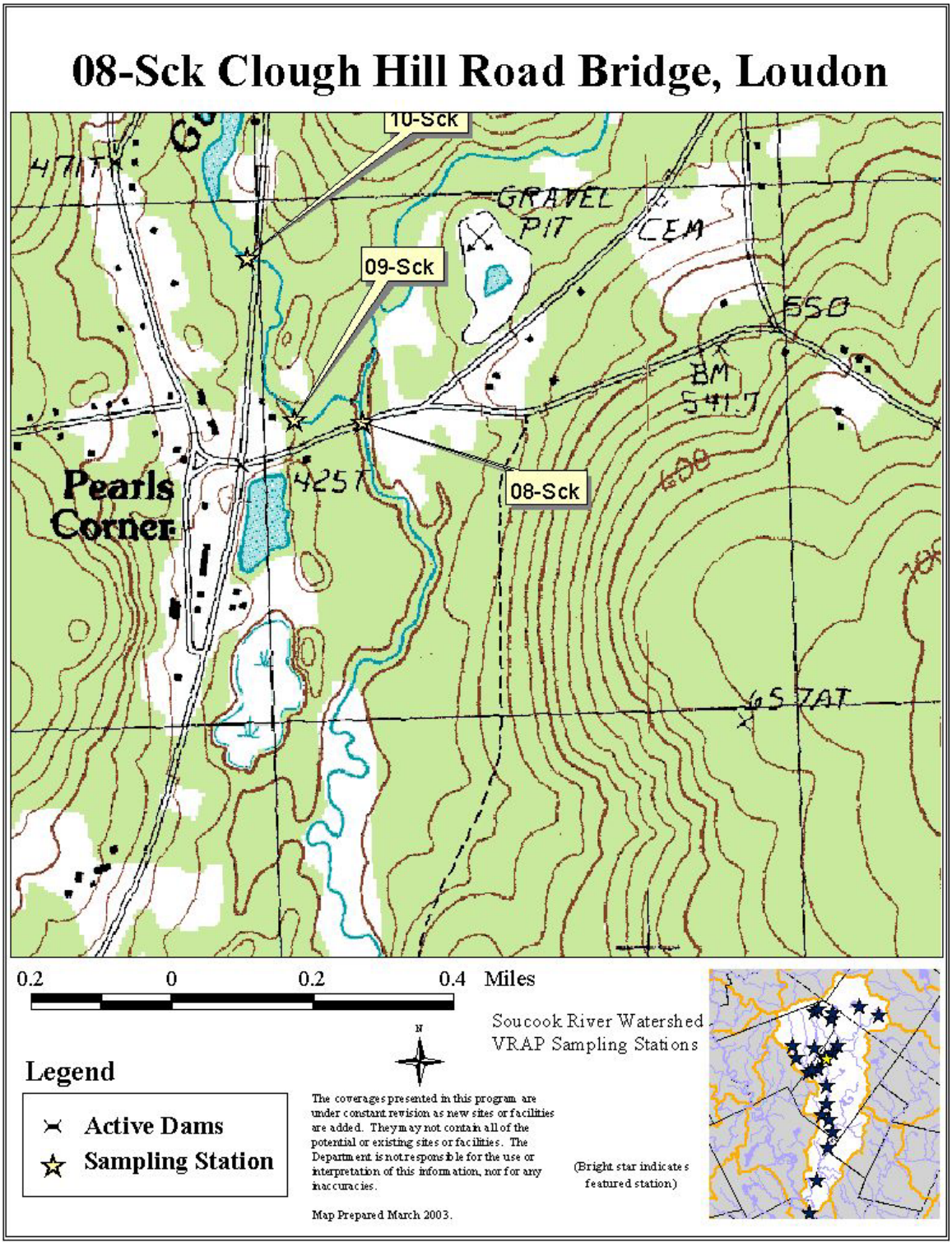
organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

Phase I:
As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

Phase II:
If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.9. 08-Sck: Clough Hill Road Bridge, Loudon, NH



4.9.1. Results and Discussion

Nine measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 9). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Three pH measurements were below the Class B water quality standards.

Table 9. Monitoring Summary: 08-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	9	9	0	7.63 - 10.08	**>5**
DO (% sat.)	9	9	0	84.1 - 112.3	**>75**
pH (Std. Units)	9	9	3	6.12 - 7.03	**6.5-8.0**
Turbidity (NTU)	9	9	0	1.1 - 2.3	**<10 above background**
Conductivity (μmho/cm)	9	9	NA	52 - 116.4	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.9.1.1. Dissolved Oxygen

Figure 9 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards.

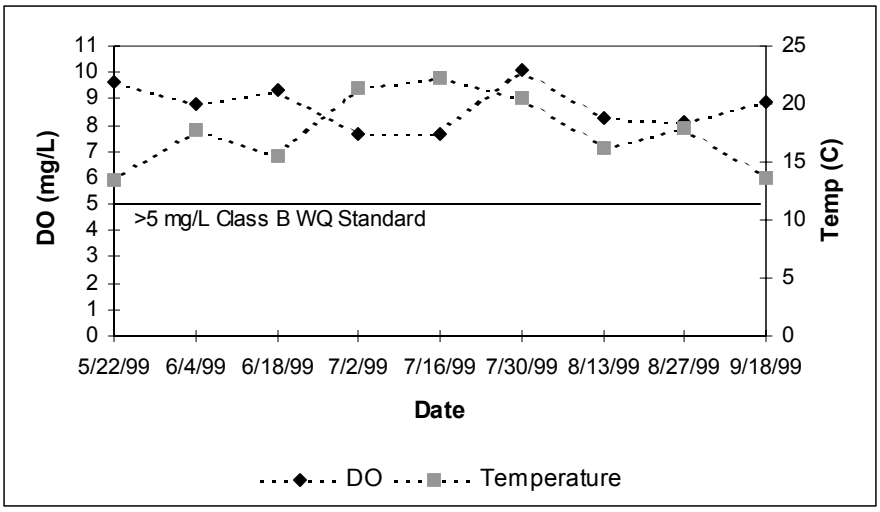


Figure 9. Dissolved Oxygen (DO) Concentration vs. Temperature.
Soucook River at 08-Sck, Clough Hill Road Bridge, Loudon, NH. VRAP, 1999.

4.9.1.2. pH

The pH at this location, ranging from 6.12 to 7.03, was measured below the state standard on three of nine monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.9.2. Recommendations:

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the

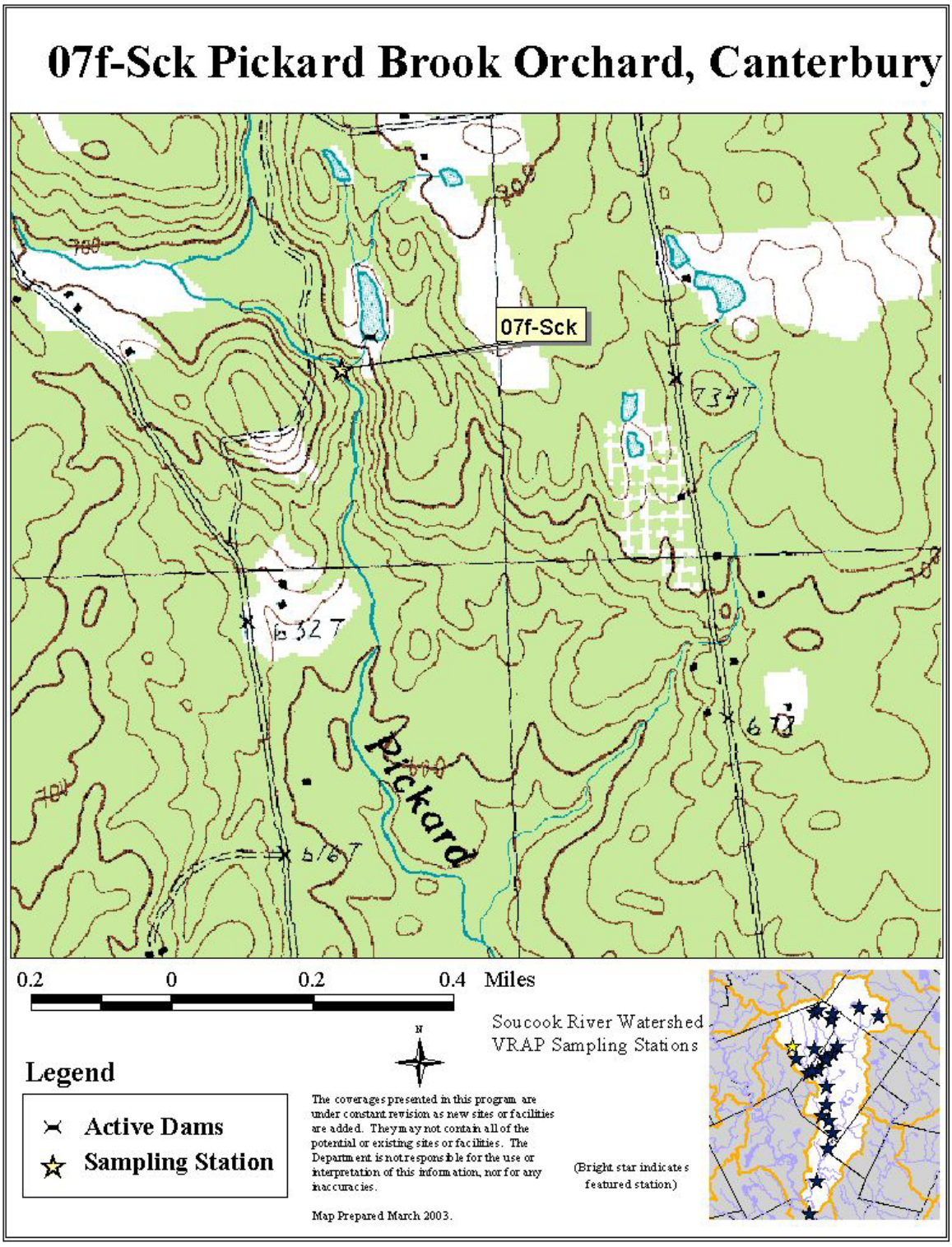
organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

Phase I:
As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

Phase II:
If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.10. 07f-Sck, Pickard Brook Orchard, Canterbury, NH



4.10.1. Results and Discussion

Two measurements were made in the field for dissolved oxygen (DO), pH, and turbidity, and one for conductivity using handheld meters (Table 10). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. One measurement for DO % saturation was below the Class B water quality standard.

Table 10. Monitoring Summary: 07f-Sck. VRAP, 1999

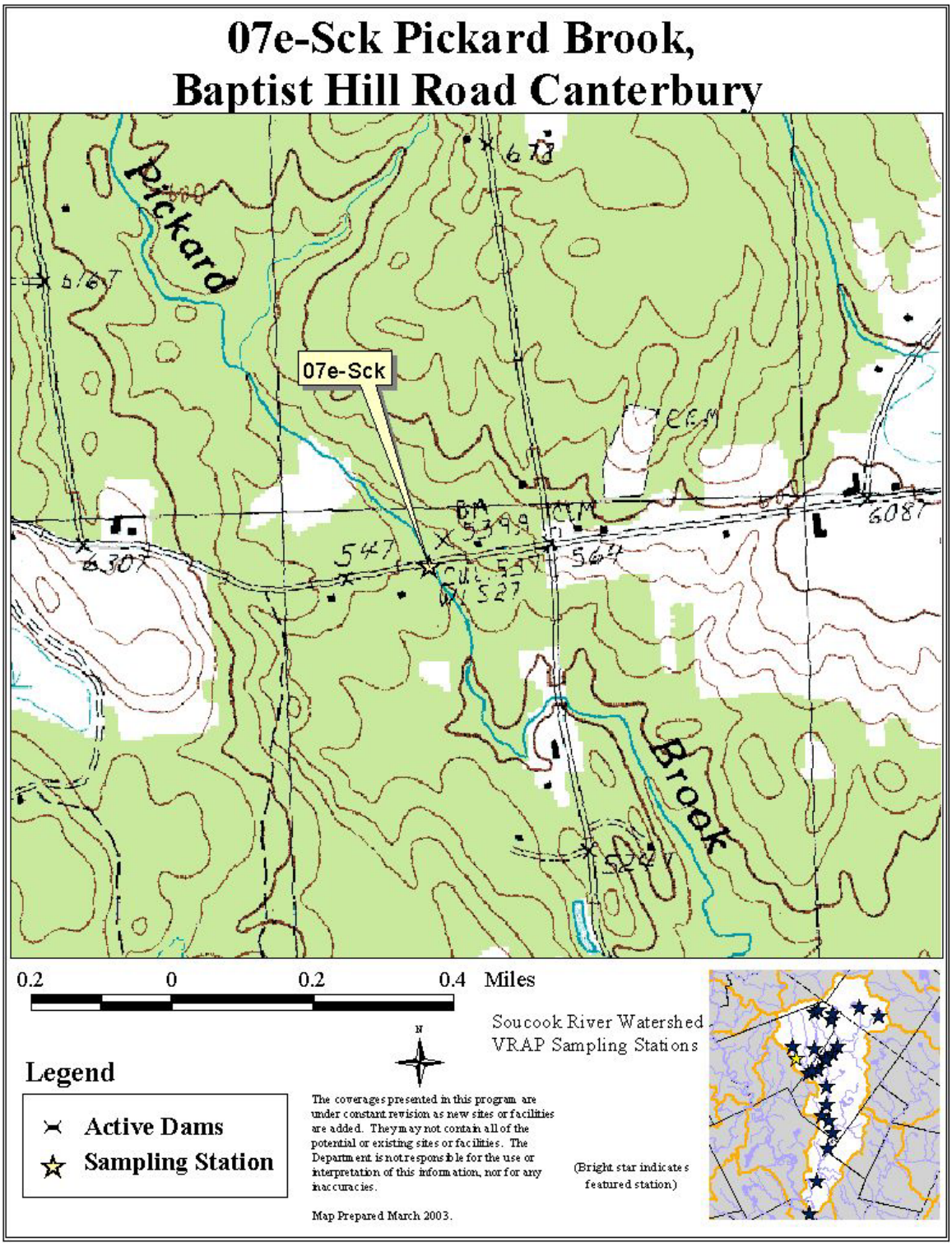
Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	2	2	0	5.61 - 7.72	**>5**
DO (% sat.)	2	2	1	62.2 - 76.9	**>75**
pH (Std. Units)	2	2	0	6.57 - 6.73	**6.5-8.0**
Turbidity (NTU)	2	2	0	0.95 - 1.9	**<10 above background**
Conductivity (μmho/cm)	1	1	NA	36	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.10.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards. In order for DES to be able to interpret station data a site must be sampled at least three times.

4.11. 07e-Sck: Pickard Brook, Baptist Hill Road Canterbury, NH



4.11.1. Results and Discussion

Seven measurements were made in the field for dissolved oxygen (DO), pH, and turbidity, and six for conductivity using handheld meters (Table 11). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Four pH measurements were below the Class B water quality standards.

Table 11. Monitoring Summary: 07e-Sck. VRAP, 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	7	7	0	6.67 - 10.13	**>5**
DO (% sat.)	7	7	0	75.1 - 94.4	**>75**
pH (Std. Units)	7	7	4	5.91 - 6.97	**6.5-8.0**
Turbidity (NTU)	7	7	0	0.53 - 1.6	**<10 above background**
Conductivity (μmho/cm)	6	6	NA	15 - 55	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.11.1.1. Dissolved Oxygen

Figure 10 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75% of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards.

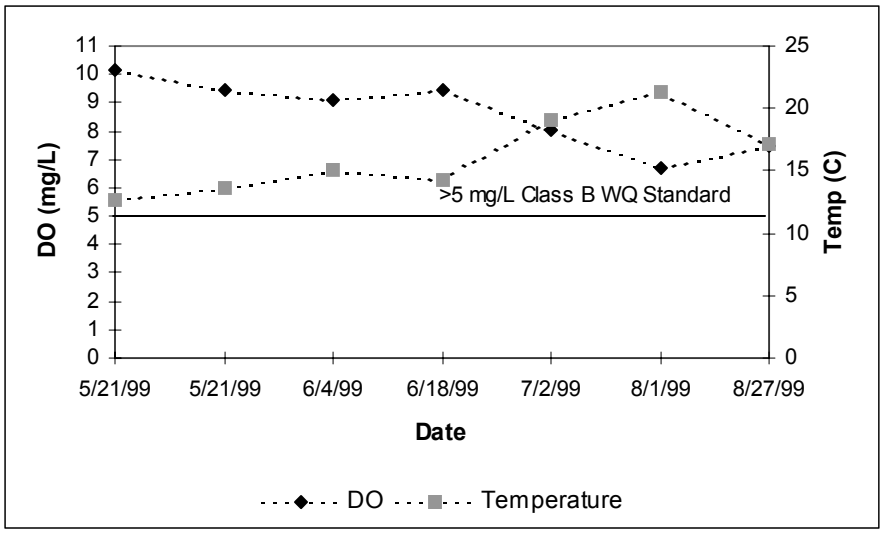


Figure 10. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 07e-Sck, Pickard Brook, Baptist Hill Road Canterbury, NH. VRAP 1999.

4.11.1.2. pH

The pH at this location, ranging from 5.91 to 6.97, was measured below the state standard on four of seven monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.11.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the

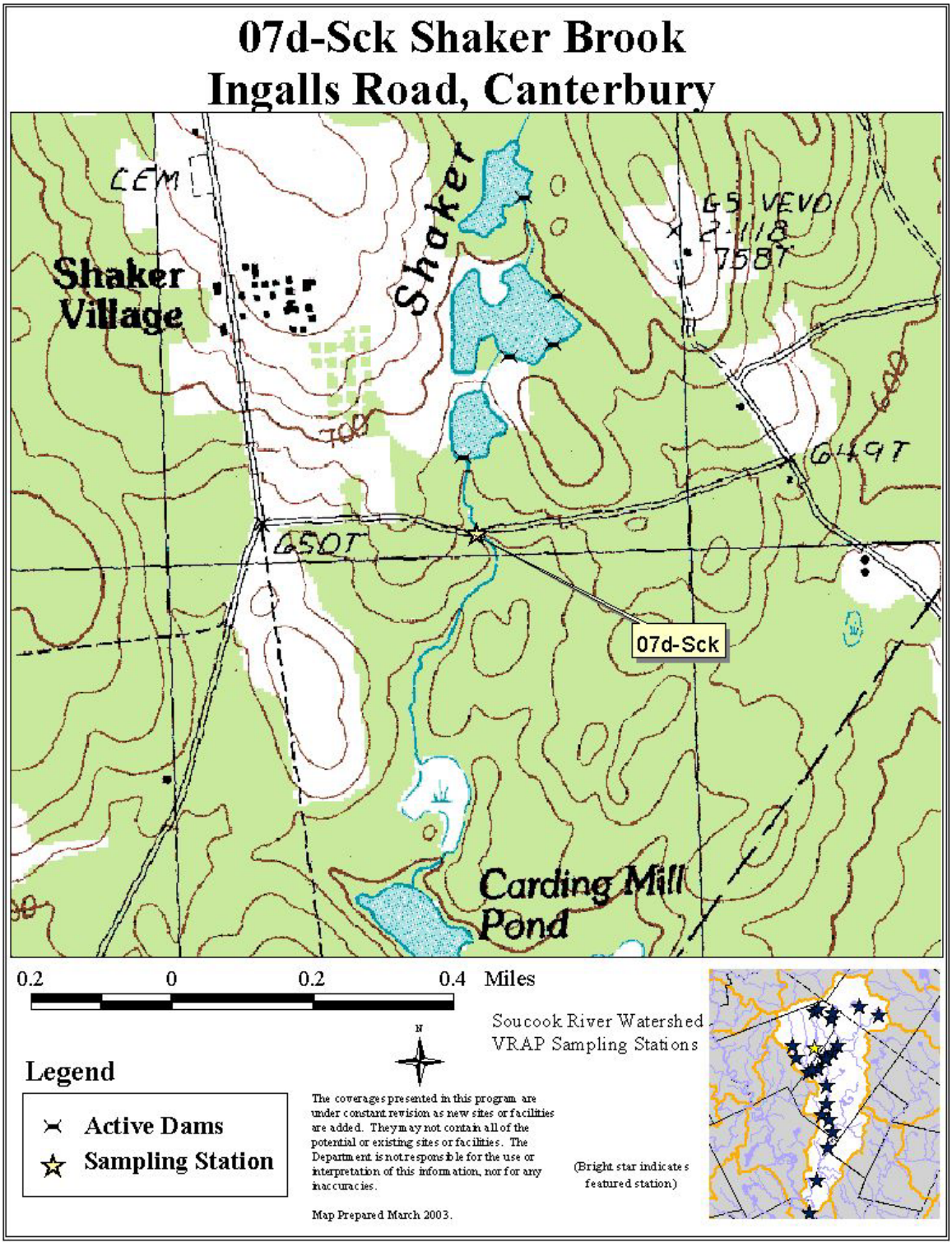
organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

Phase I:
As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

Phase II:
If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.12. 07d-Sck: Shaker Brook, Ingalls Road Canterbury, NH



4.12.1. Results and Discussion

Five measurements were made in the field for dissolved oxygen (DO), pH, and turbidity, and four for conductivity using handheld meters (Table 12). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. One pH measurement was below the Class B water quality standards.

Table 12. Monitoring Summary: 07d-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	5	5	0	8.18 - 9.85	**>5**
DO (% sat.)	5	5	0	85.6 - 93	**>75**
pH (Std. Units)	5	5	1	6.2 - 7.18	**6.5-8.0**
Turbidity (NTU)	5	5	0	0.53 - 3.8	**<10 above background**
Conductivity (μmho/cm)	4	4	NA	69 - 110	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.12.1.1. Dissolved Oxygen

Figure 11 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75% of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards.

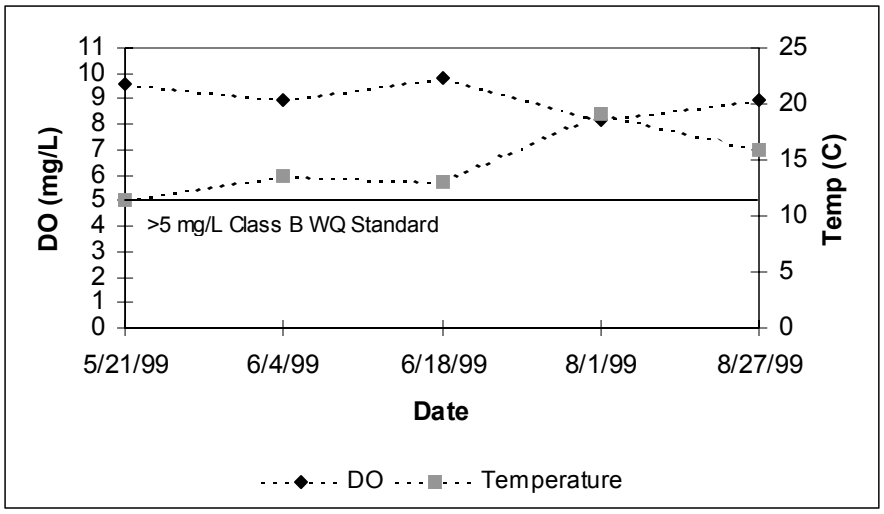


Figure 11. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 07d-Sck, Shaker Brook, Ingalls Road Canterbury, NH. VRAP, 1999.

4.12.1.2. pH

The pH at this location, ranging from 6.2 to 7.18, was measured below the state standard on one of five monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.12.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

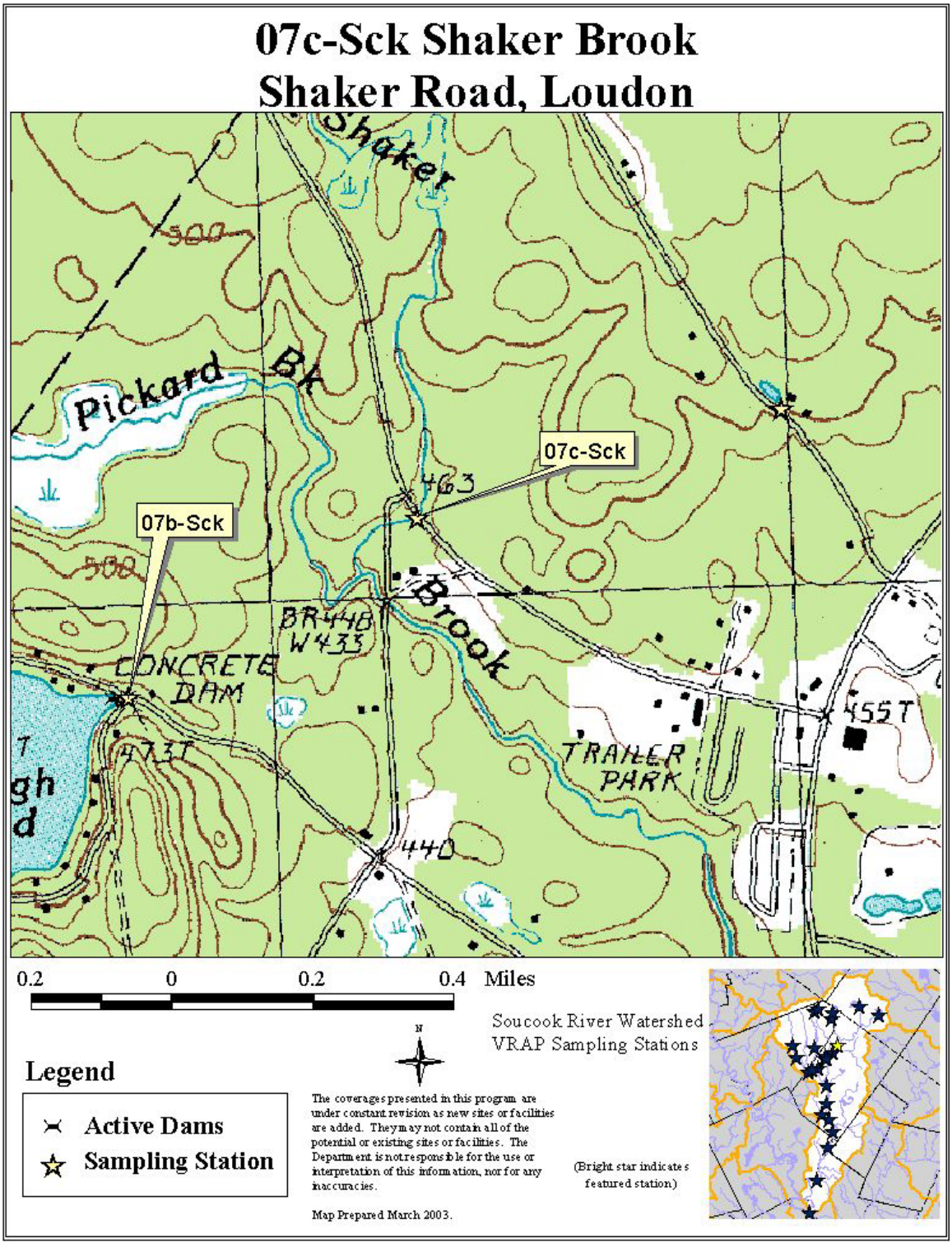
- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

Phase I:
As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

Phase II:
If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.13. 07c-Sck: Shaker Brook, Shaker Road Loudon, NH



4.13.1. Results and Discussion

Six measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and five for conductivity using handheld meters (Table 13). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Five pH measurements were below the Class B water quality standards. Five measurements for DO % saturation were lower than 75%, and one for DO concentration was below 5.0 mg/L. This indicates a potential DO and pH problem at this site.

Table13. Monitoring Summary: 07c-Sck. VRAP, 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	6	6	1	4.8 - 9.39	**>5**
DO (% sat.)	6	6	5	56.3 - 89.8	**>75**
pH (Std. Units)	6	6	5	6.12 - 6.49	**6.5-8.0**
Turbidity (NTU)	6	6	0	1.6 - 4.2	**<10 above background**
Conductivity (μmho/cm)	5	5	NA	50 - 65.4	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.13.1.1. Dissolved Oxygen

Dissolved oxygen concentrations at 07c-Sck were, on many occasions, less than the minimum instantaneous concentration of 5 mg/L (see Figure 12). The Class B New Hampshire surface water quality standard for DO is a minimum concentration of 5.0 mg/L **and** minimum daily average saturation of 75%. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. However, the low DO concentrations suggest a possible problem, or may be the result of natural conditions (e.g., the presence of wetlands or stagnant water caused by a beaver dam). An accurate determination of whether the DO standard is met for % saturation can only be done using multiple measurements of saturation collected during any single day. Additional sampling and a thorough description of this station are necessary to determine the extent of the potential problem.

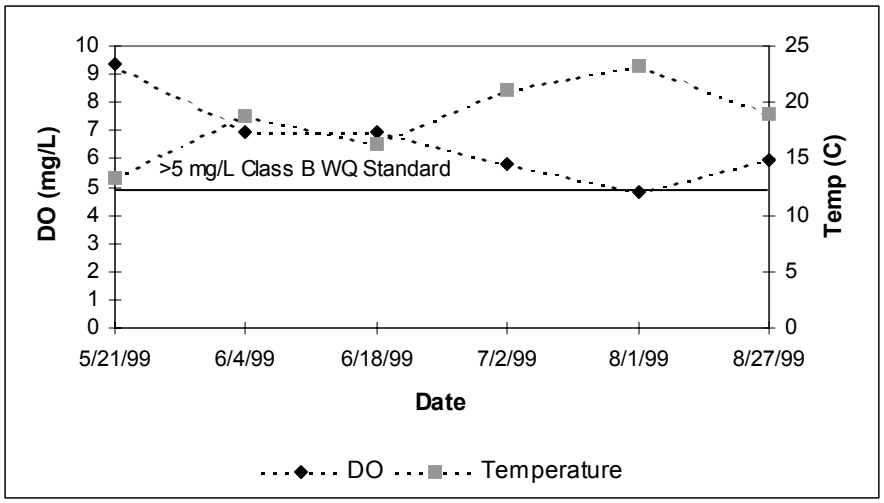


Figure 12. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 07c-Shaker Brook, Shaker Road Loudon, NH. VRAP 1999.

4.13.1.2. pH

The pH at this location, ranging from 6.12 to 6.49, was measured below the state standard on five of six monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.13.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the

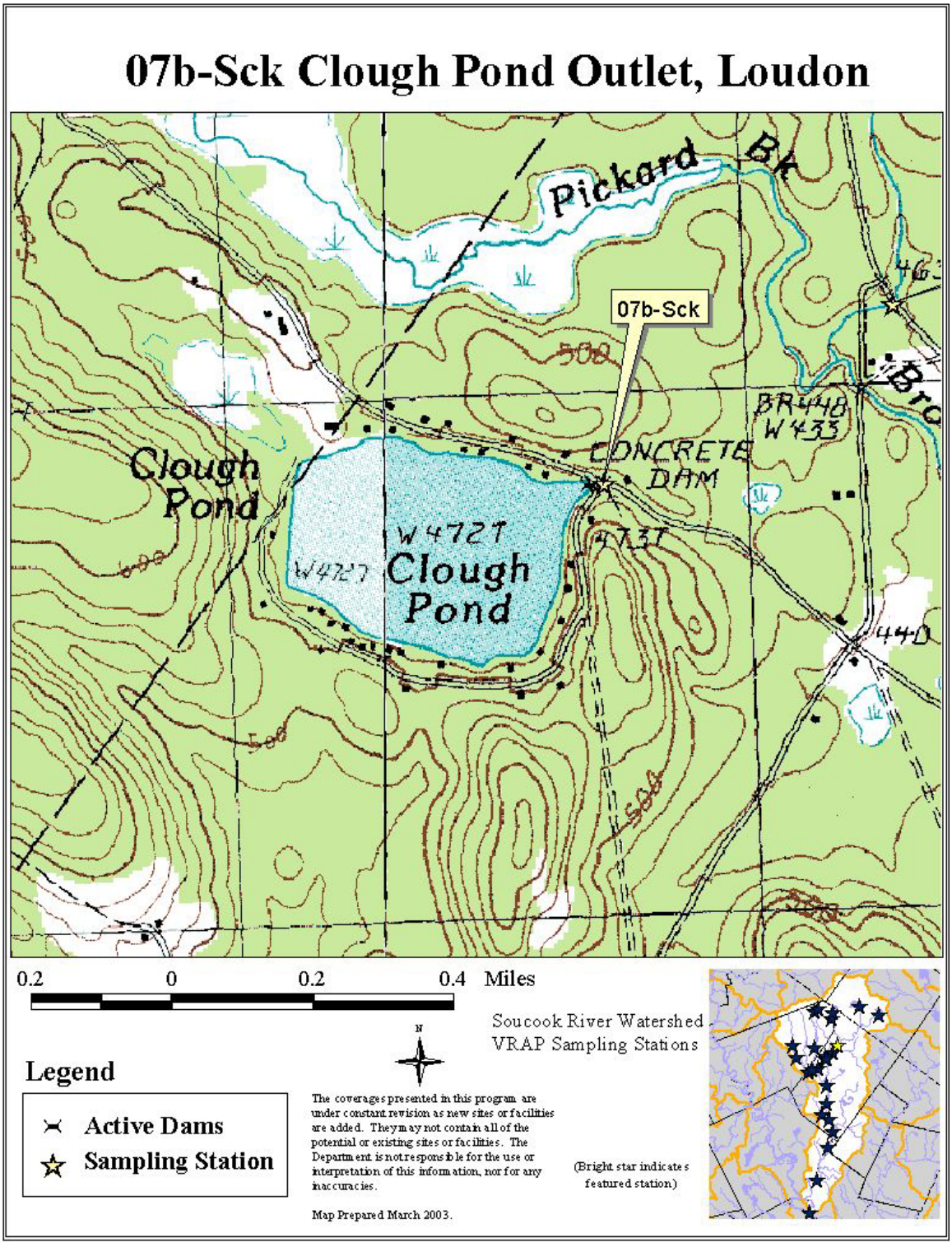
organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

Phase I:
As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

Phase II:
If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.14. 07b-Sck: Clough Pond Outlet, Loudon, NH



4.14.1. Results and Discussion

Six water quality measurements were made in the field for each parameter except for conductivity, which was measured five times (Table 14). All measurements and samples met the QA/QC requirements. Two pH measurements were below the Class B water quality standards. One measurement for DO % saturation was lower than 75%, but this does not necessarily indicate a DO problem.

Table 14. Monitoring Summary: 07b-Sck. VRAP, 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	6	6	0	5.7 - 9.51	**>5**
DO (% sat.)	6	6	1	64.6 - 99.1	**>75**
pH (Std. Units)	6	6	2	6.21 - 7.06	**6.5-8.0**
Turbidity (NTU)	6	6	0	0.7 - 5.8	**<10 above background**
Conductivity (μmho/cm)	5	5	NA	10 - 60	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.14.1.1. Dissolved Oxygen

Dissolved oxygen saturation in the river at 07b-Sck was on one occasion, less than the minimum daily saturation of 75% (see Figure 13). The Class B New Hampshire surface water quality standard for DO is a minimum concentration of 5.0 mg/L **and** minimum daily average saturation of 75%. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. However, the low DO concentrations suggest a possible problem, or may be the result of natural conditions (e.g., the presence of wetlands or stagnant water caused by a beaver dam). An accurate determination of whether the DO standard is met for % saturation can only be done using multiple measurements of saturation collected during any single day. Additional sampling and a thorough description of this station are necessary to determine the extent of the potential problem.

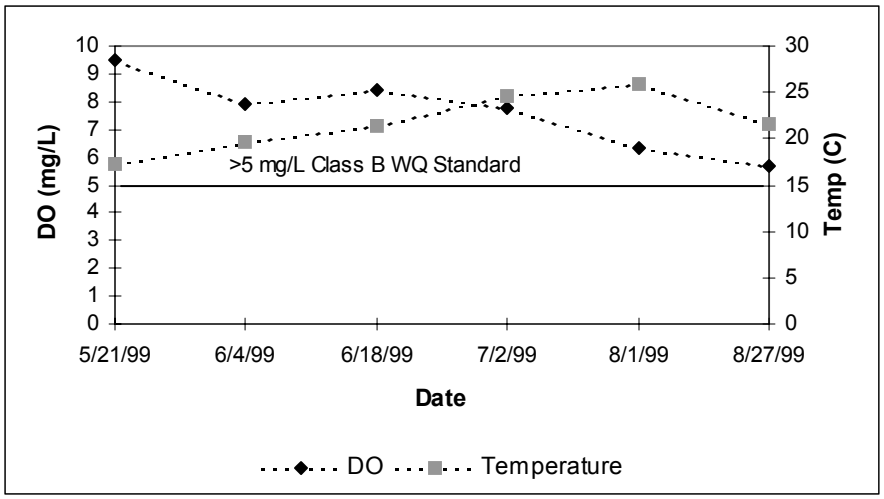


Figure 13. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 07b-Sck, Clough Pond Outlet, Loudon, NH. VRAP, 1999.

4.14.1.2. pH

The pH at this location, ranging from 6.21 to 7.06, was measured below the state standard on two of six monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.14.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

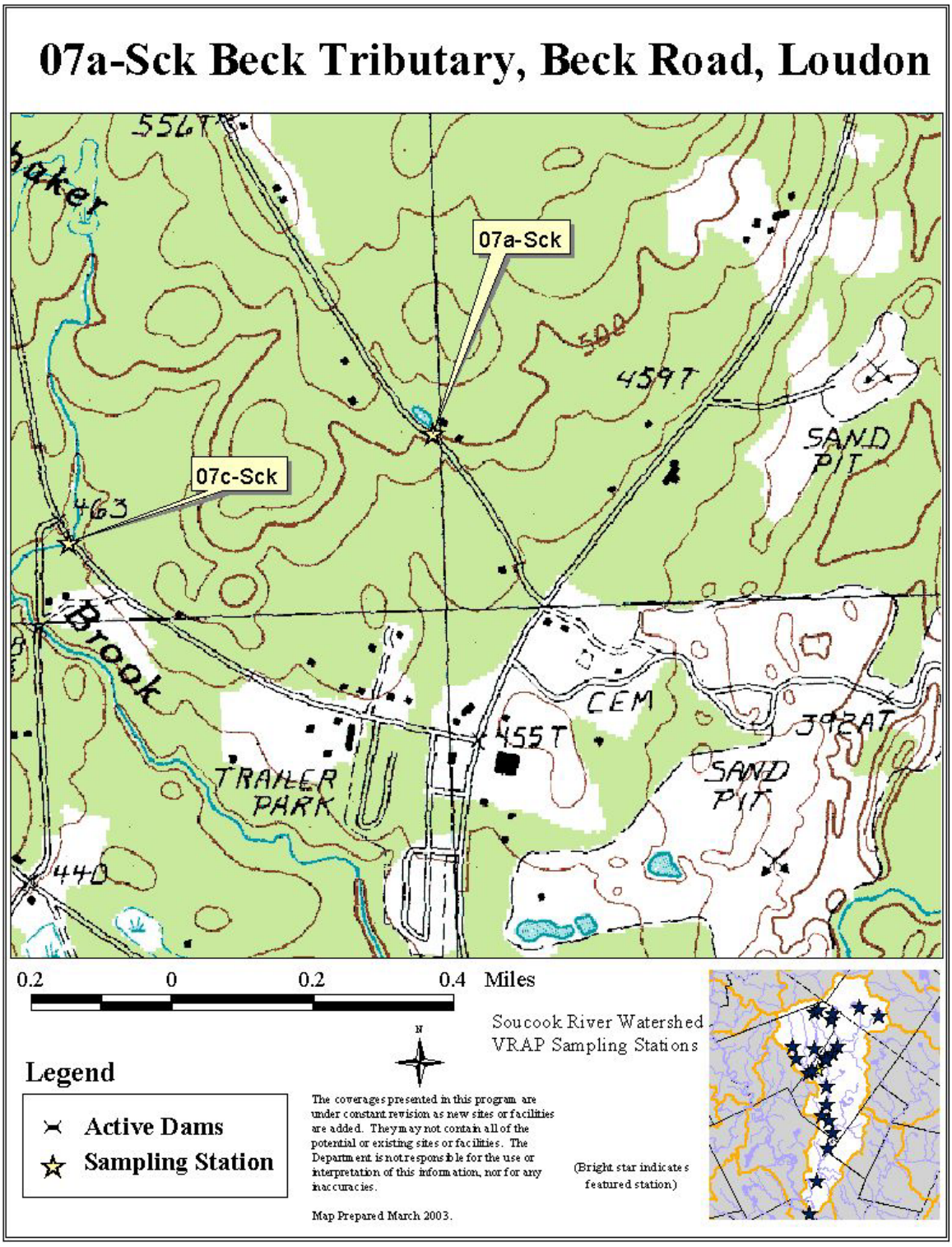
  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. It is likely that pH conditions in Clough

Pond are the primary influence on pH conditions at this site. Volunteers may want to contact DES's Volunteer Lake Assessment Program to see if pH data has been collected for Clough Pond. In addition, volunteer could walk around the area looking for additional wetland drainage upstream from the site and test for pH. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

- *Dissolved Oxygen*: Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.15. 07a-Sck: Beck Tributary, Beck Road Loudon, NH



4.15.1. Results and Discussion

One water quality measurement was made in the field for each parameter except for conductivity (Table 15). All measurements and samples met the QA/QC requirements.

Table 15. Monitoring Summary: 07a-Sck. VRAP, Year 1999.

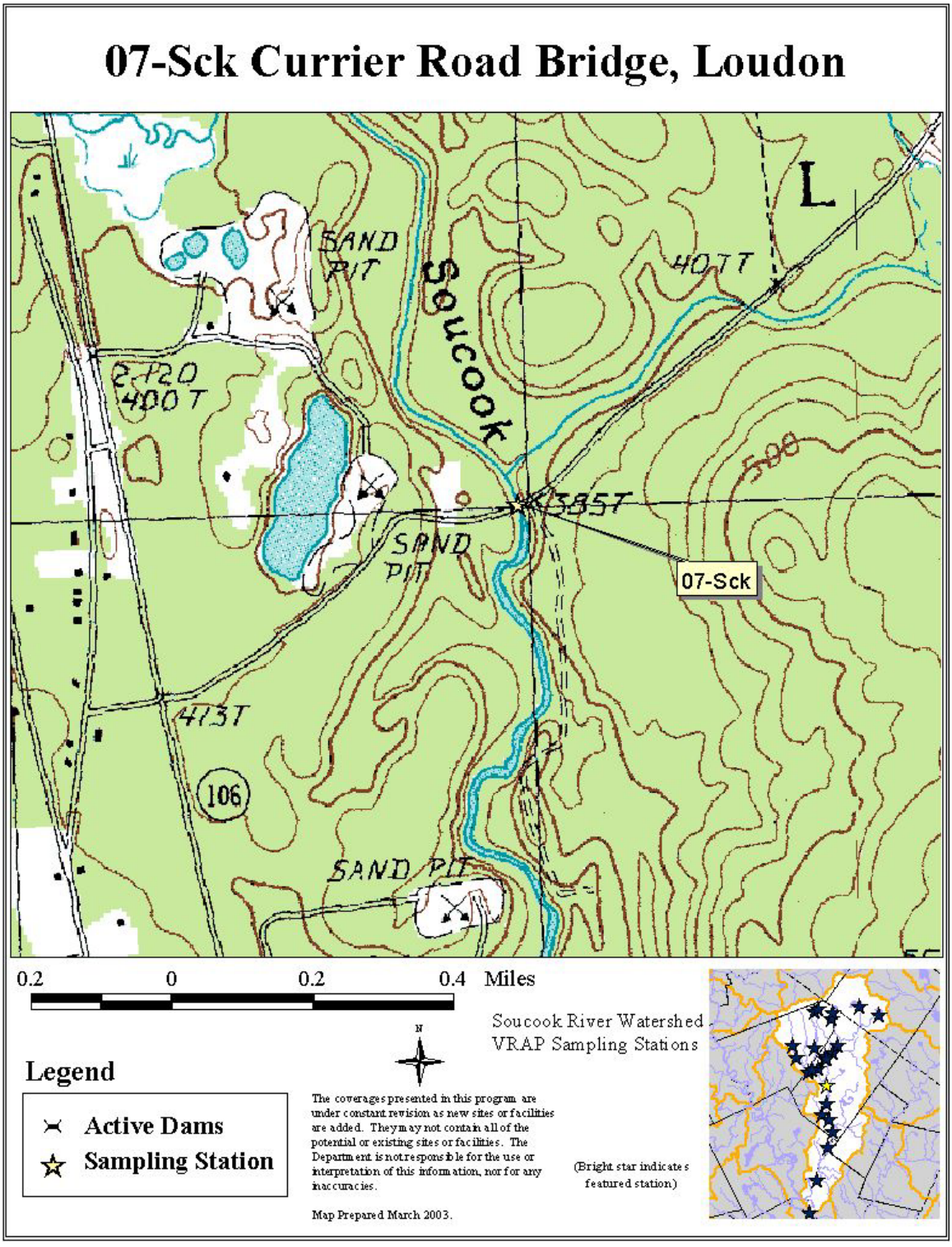
Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	1	1	1	4.2	**>5**
DO (% sat.)	1	1	1	38.2	**>75**
pH (Std. Units)	1	1	1	6.45	**6.5-8.0**
Turbidity (NTU)	1	1	0	0.95	**<10 above background**
Conductivity (µmho/cm)	1	1	NA	110	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.15.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards. In order for DES to be able to interpret station data a site must be sampled at least three times.

4.16. 07-Sck: Currier Road Bridge, Loudon, NH



4.16.1. Results and Discussion

Six measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 16). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Two pH measurements were below the Class B water quality standards. One measurement for DO % saturation was lower than 75%, but this does not necessarily indicate a DO problem.

Table 16. Monitoring Summary: 07-Sck. VRAP, Year 1999

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	6	6	0	5.64 - 9.34	**>5**
DO (% sat.)	6	6	1	72.4 - 96.4	**>75**
pH (Std. Units)	6	6	2	6.06 - 6.81	**6.5-8.0**
Turbidity (NTU)	6	6	0	0.85 - 3.3	**<10 above background**
Conductivity (μmho/cm)	6	6	NA	50 - 145.5	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.16.1.1. Dissolved Oxygen

Dissolved oxygen saturation in the river at 07-Sck was, on one occasion, less than the minimum daily average saturation of 75% (see Figure 14). The Class B New Hampshire surface water quality standard for DO is a minimum concentration of 5.0 mg/L **and** minimum daily average saturation of 75%. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. However, the low DO concentrations suggest a possible problem, or may be the result of natural conditions (e.g., the presence of wetlands or stagnant water caused by a beaver dam). An accurate determination of whether the DO standard is met for % saturation can only be done using multiple measurements of saturation collected during any single day. Additional sampling and a thorough description of this station are necessary to determine the extent of the potential problem.

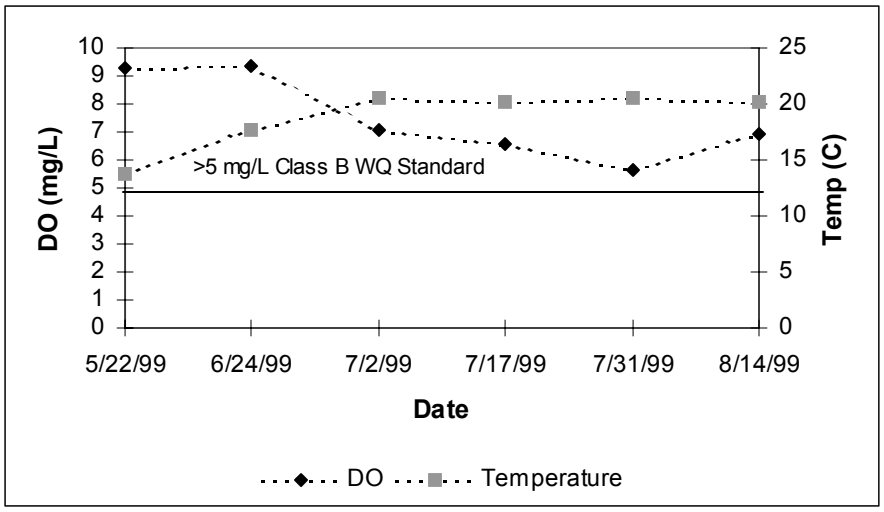


Figure 14. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 07-Sck, Currier Road Bridge Loudon, NH. VRAP, 1999.

4.16.1.2. pH

The pH at this location, ranging from 6.06 to 6.81, was measured below the state standard on three of nine monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.16.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station.

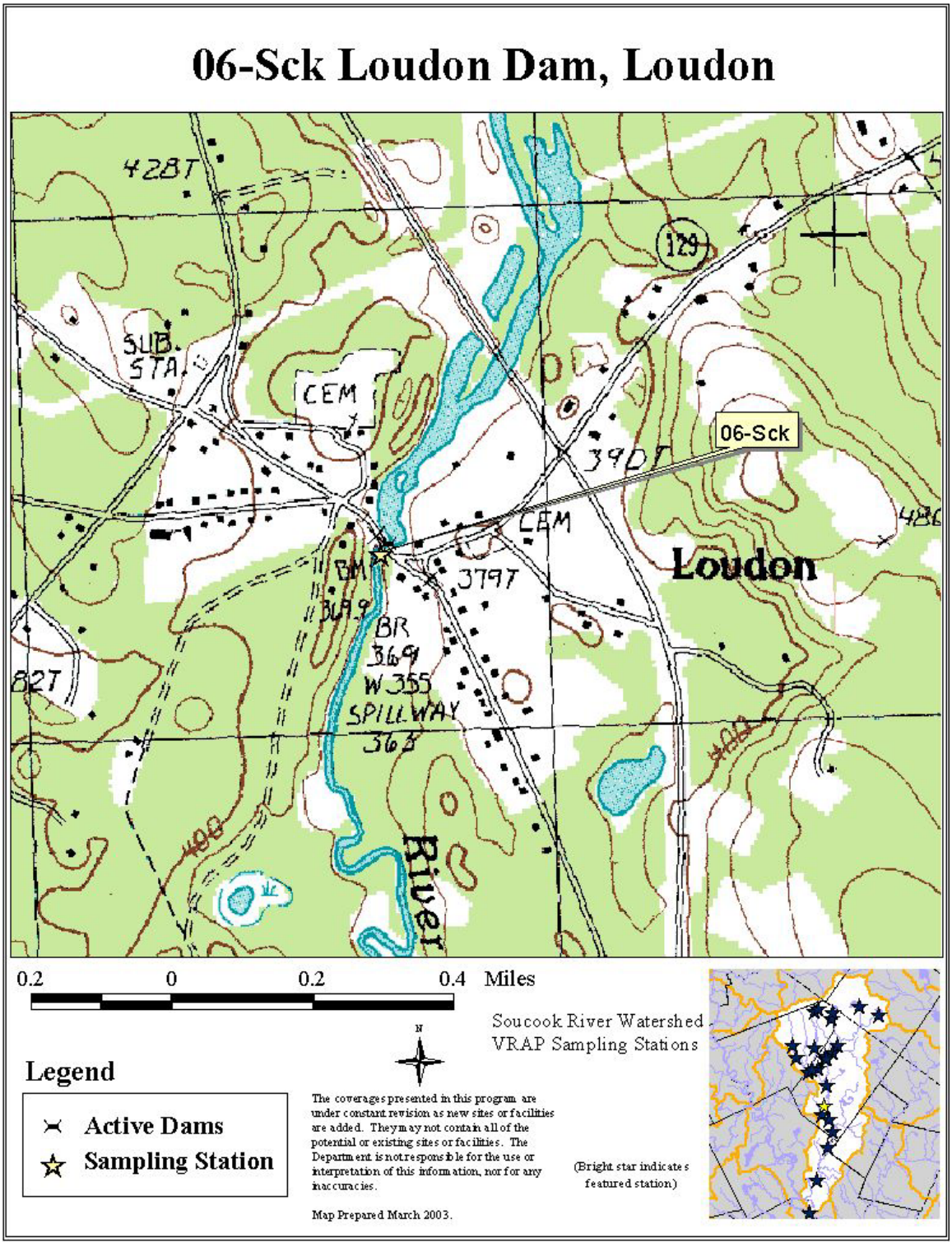
- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

Phase I:
As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

Phase II:
If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.17. 06-Sck: Loudon Dam, Loudon, NH



4.17.1. Results and Discussion

Seven measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 17). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. One pH measurement was below the Class B water quality standards. Two measurements for DO % saturation were lower than 75%, and one for DO concentration was below 5.0 mg/L.

Table 17. Monitoring Summary: 06-Sck. VRAP, 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	7	7	1	4.41 - 8.25	**>5**
DO (% sat.)	7	7	2	51.3 - 96.6	**>75**
pH (Std. Units)	7	7	1	6.35 - 7.07	**6.5-8.0**
Turbidity (NTU)	7	7	0	1.3 - 2.35	**<10 above background**
Conductivity (μmho/cm)	7	7	NA	50 - 144.6	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.17.1.1. Dissolved Oxygen

Dissolved oxygen concentrations in the river at 06-Sck were, on one occasion, less than the minimum instantaneous concentration of 5 mg/L and on two occasions less than the minimum daily average saturation of 75% (see Figure 15). The Class B New Hampshire surface water quality standard for DO is a minimum concentration of 5.0 mg/L **and** minimum daily average saturation of 75%. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. However, the low DO concentrations suggest a possible problem, or may be the result of natural conditions (e.g., the presence of wetlands or stagnant water caused by a beaver dam). An accurate determination of whether the DO standard is met for % saturation can only be done using multiple measurements of saturation collected during any single day. Additional sampling and a thorough description of this station are necessary to determine the extent of the potential problem.

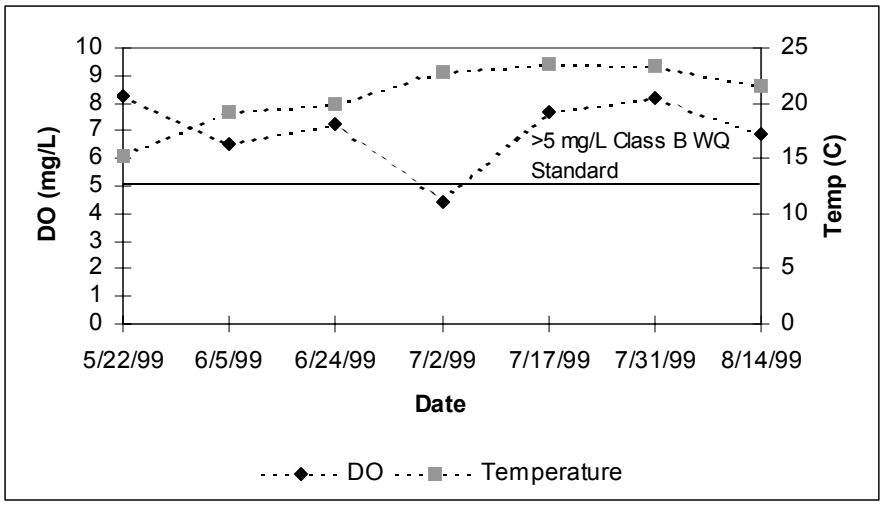


Figure 15. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 06-Sck, Loudon Dam, Loudon, NH. VRAP, 1999.

4.17.1.2. pH

The pH at this location, ranging from 6.35 to 7.07, was measured below the state standard on one of seven monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.17.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station

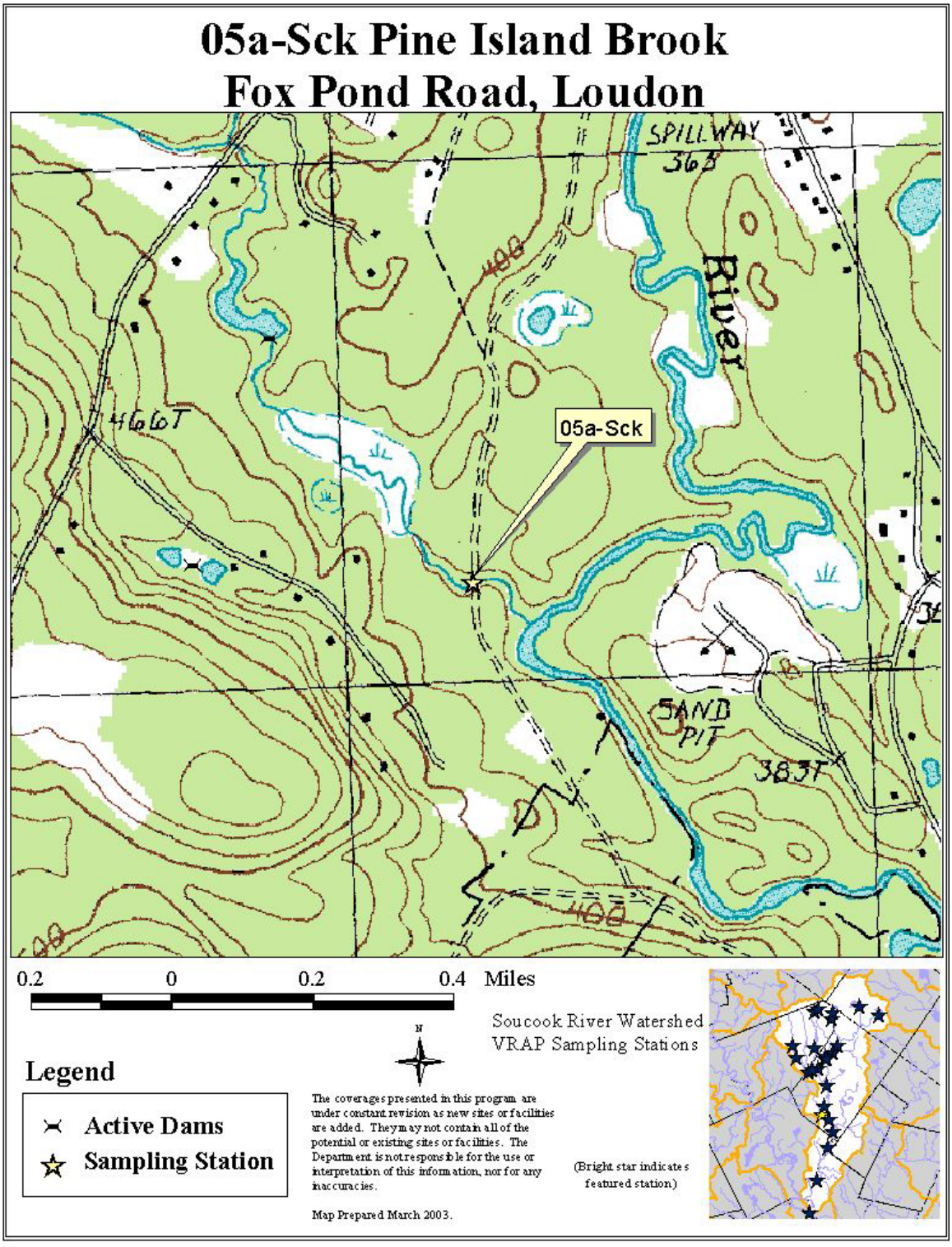
- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

Phase I:
As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

Phase II:
If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.18. 05a-Sck: Pine Island Brook, Fox Pond Road Loudon, NH



4.18.1. Results and Discussion

Seven measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 18). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. Two pH measurements were below the Class B water quality standards. Two measurements for DO % saturation were lower than 75%.

Table 18. Monitoring Summary: 05a-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	7	7	0	6.62 - 9.45	**>5**
DO (% sat.)	7	7	2	59.5 - 106.9	**>75**
pH (Std. Units)	7	7	2	6.28 - 6.92	**6.5-8.0**
Turbidity (NTU)	7	7	0	1.7 - 4.96	**<10 above background**
Conductivity (µmho/cm)	7	7	NA	52 - 118	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.18.1.1. Dissolved Oxygen

Figure 16 shows dissolved oxygen concentration and water temperature during 1999. Levels of DO sustained above the standards are considered adequate for wildlife populations and other desirable water quality conditions. The DO % saturation (75%) was not met on two occasions, which indicates a potential problem. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % of saturation. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. An accurate determination of whether the DO standard is met for % saturation can only be done using multiple measurements of saturation collected during any single day. Additional sampling and a thorough description of this station are necessary to determine the extent of the potential problem.

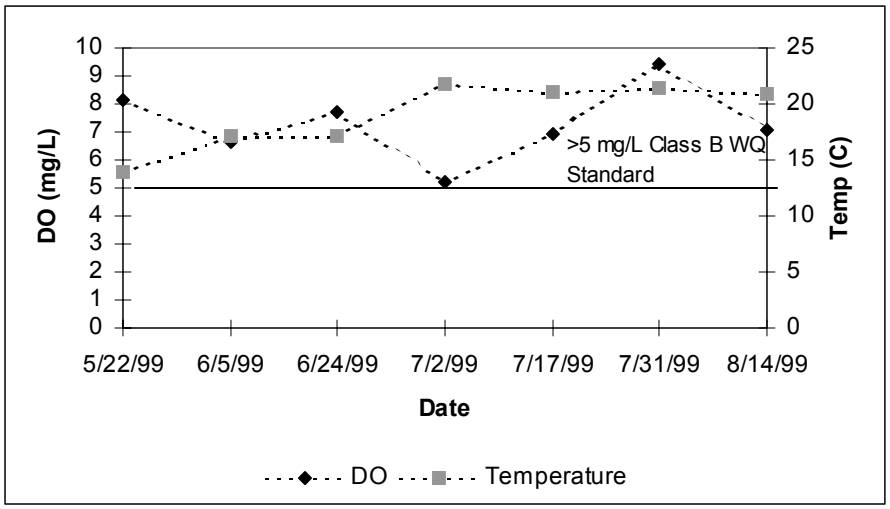


Figure 16. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 05a-Sck, Pine Island Brook, Loudon, NH. VRAP, 1999.

4.18.1.2. pH

The pH at this location, ranging from 6.28 to 6.92, was measured below the state standard on two of seven monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.18.2. Recommendations:

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station

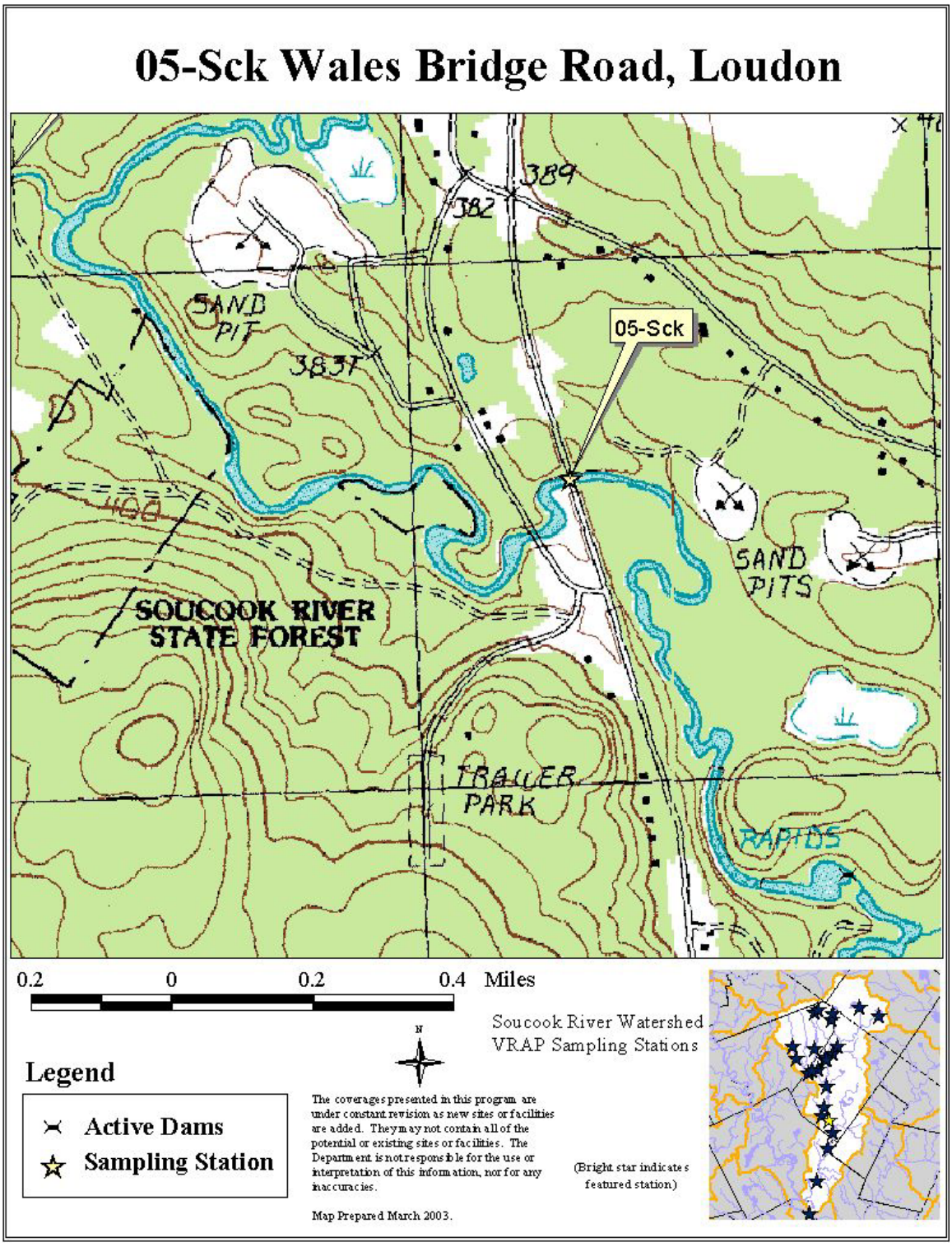
- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

Phase I:
As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

Phase II:
If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.19. 05-Sck: Wales Bridge Road, Loudon, NH



4.19.1. Results and Discussion

Seven measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 19). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. All measurement were within DES water quality standards.

Table 19. Monitoring Summary: 05-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	7	7	0	7.15 - 9.33	>5
DO (% sat.)	7	7	2	87.2 - 108.3	>75
pH (Std. Units)	7	7	2	6.5 - 6.91	6.5-8.0
Turbidity (NTU)	7	7	0	0.13 - 138.2	<10 above background
Conductivity (µmho/cm)	7	7	NA	51 - 160	NA

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.19.1.1. Dissolved Oxygen

Figure 17 shows dissolved oxygen concentration and water temperature during 1999. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % sat. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. Therefore, additional DO saturation data collected at this location are needed.

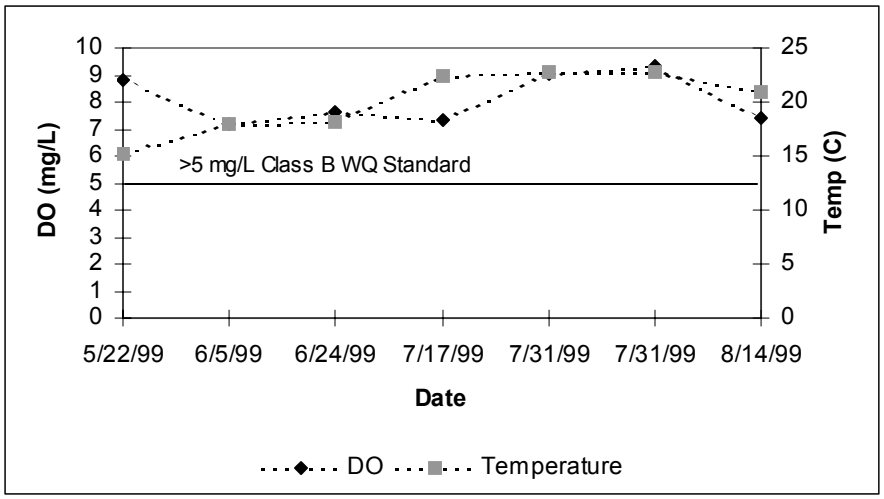


Figure 17. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 05-Sck, Wales Bridge Road, Loudon, NH. VRAP, 1999.

4.19.1.2. pH

The pH at this location, ranging from 6.5 to 6.91 and was not in violation of water quality standards on any occasion. The precision of the VRAP pH meters (+/- 0.02) requires that results within 0.02 of the standard range (6.5 to 8.0) are not considered out of range. For example, a reading of 6.48 is considered within range, while a reading of 6.47 falls below the standard range.

Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.19.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station

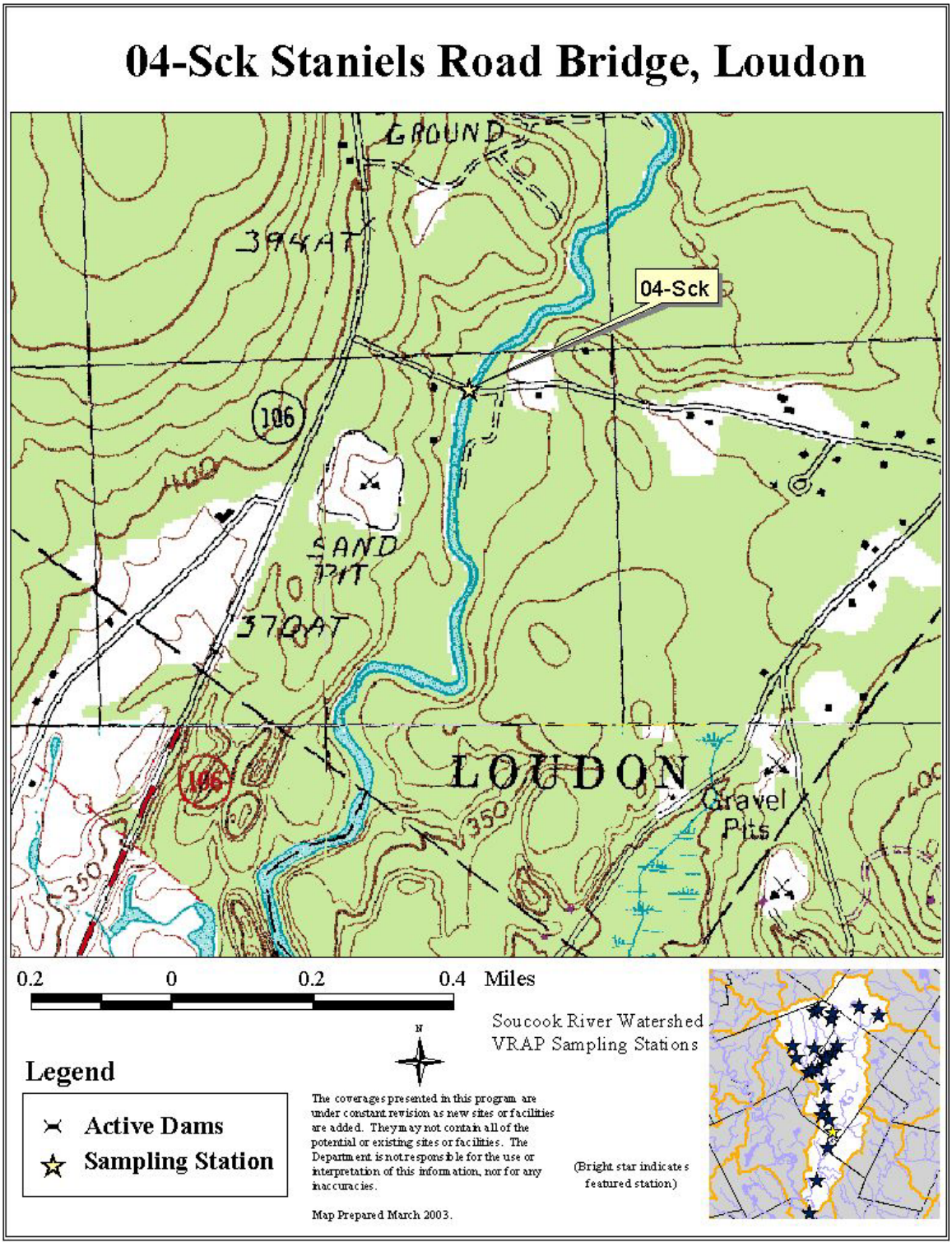
- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

  Phase I:
  As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

  Phase II:
  If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.20. 04-Sck: Staniels Road Bridge, Loudon, NH



4.20.1. Results and Discussion

Seven measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 20). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. One measurement for DO % saturation was lower than 75%, but this does not necessarily indicated a DO problem.

Table 20. Monitoring Summary: 04-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	7	7	0	5.69 - 9.34	>5
DO (% sat.)	7	7	1	61.8 - 108.1	>75
pH (Std. Units)	7	7	0	6.53 - 7.03	6.5-8.0
Turbidity (NTU)	7	7	0	1.4 - 1.9	<10 above background
Conductivity (µmho/cm)	7	7	NA	51 - 126.9	NA

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.20.1.1. Dissolved Oxygen

Figure 18 shows dissolved oxygen concentration and water temperature during 1999. Dissolved oxygen saturation in the river at 04-Sck was, on one occasion, less than the minimum daily average saturation of 75%. The Class B New Hampshire surface water quality standard for DO is a minimum concentration of 5.0 mg/L **and** minimum daily average saturation of 75%. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. However, the low DO concentrations suggest a possible problem, or may be the result of natural conditions (e.g., the presence of wetlands or stagnant water caused by a beaver dam). An accurate determination of whether the DO standard is met for % saturation can only be done using multiple measurements of saturation collected during any single day. Additional sampling and a thorough description of this station are necessary to determine the extent of the potential problem.

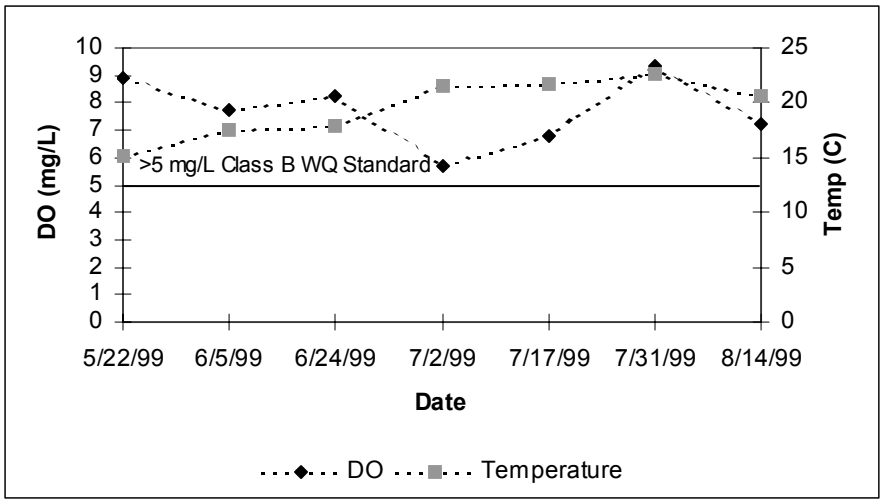


Figure 18. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 04-Sck, Staniels Road Bridge, Loudon, NH. VRAP, 1999.

4.20.1.2. pH

The pH at this location, ranging from 6.53 to 7.03, was measured above the state standard on all monitoring dates. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.20.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

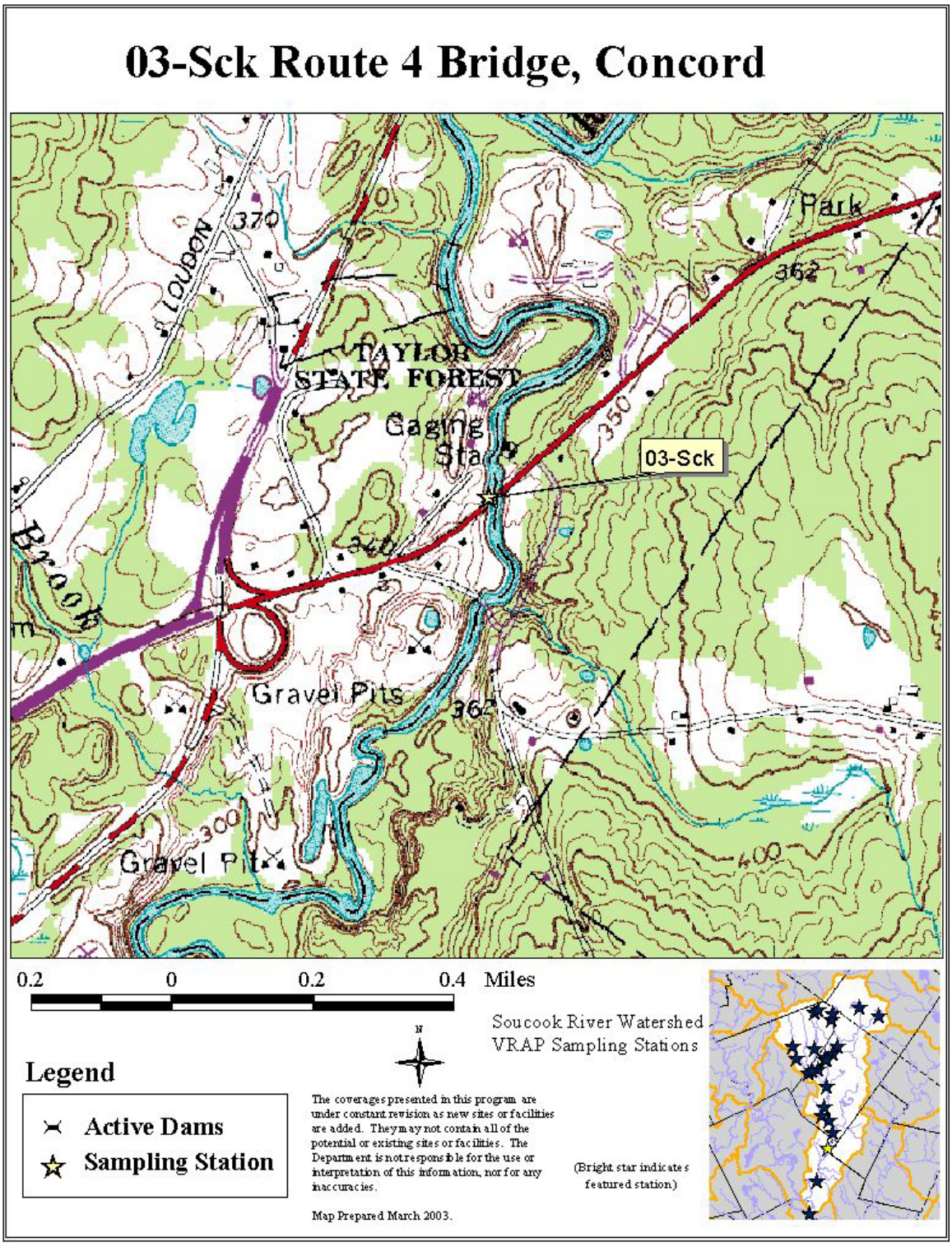
  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station

- *pH*: If wetland drainage is present, sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will

help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.21. 03-Sck: Route 4 Bridge, Loudon, NH



4.21.1. Results and Discussion

Six measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 21). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. All measurements were within NH water quality standards.

Table 21. Monitoring Summary: 03-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	6	6	0	7.33 - 9.94	**>5**
DO (% sat.)	6	6	0	81.9 - 116.9	**>75**
pH (Std. Units)	6	6	0	6.48 - 7.0	**6.5-8.0**
Turbidity (NTU)	6	6	0	1.2 - 1.9	**<10 above background**
Conductivity (μmho/cm)	6	6	NA	55 - 133.2	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.21.1.1. Dissolved Oxygen

Figure 19 shows dissolved oxygen concentration and water temperature during 1999. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % sat. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. Therefore, additional DO saturation data collected at this location are needed.

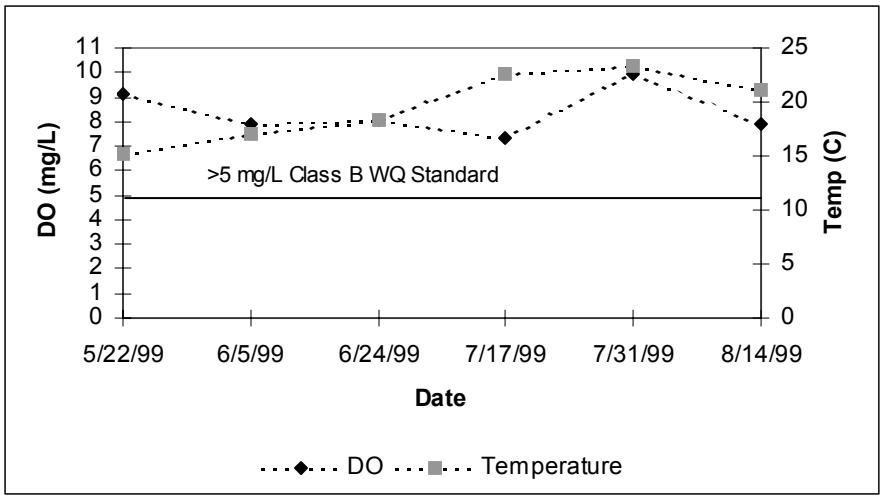


Figure 19. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 03-Sck, Route 4 Bridge, Loudon, NH. VRAP, 1999.

4.21.1.2. pH

The pH at this location, ranging from 6.48 to 7.0 and was not in violation of water quality standards on any occasion. The precision of the VRAP pH meters (+/- 0.02) requires that results within 0.02 of the standard range (6.5 to 8.0) are not considered out of range. For example, a reading of 6.48 is considered within range, while a reading of 6.47 falls below the standard range.

Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.21.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station

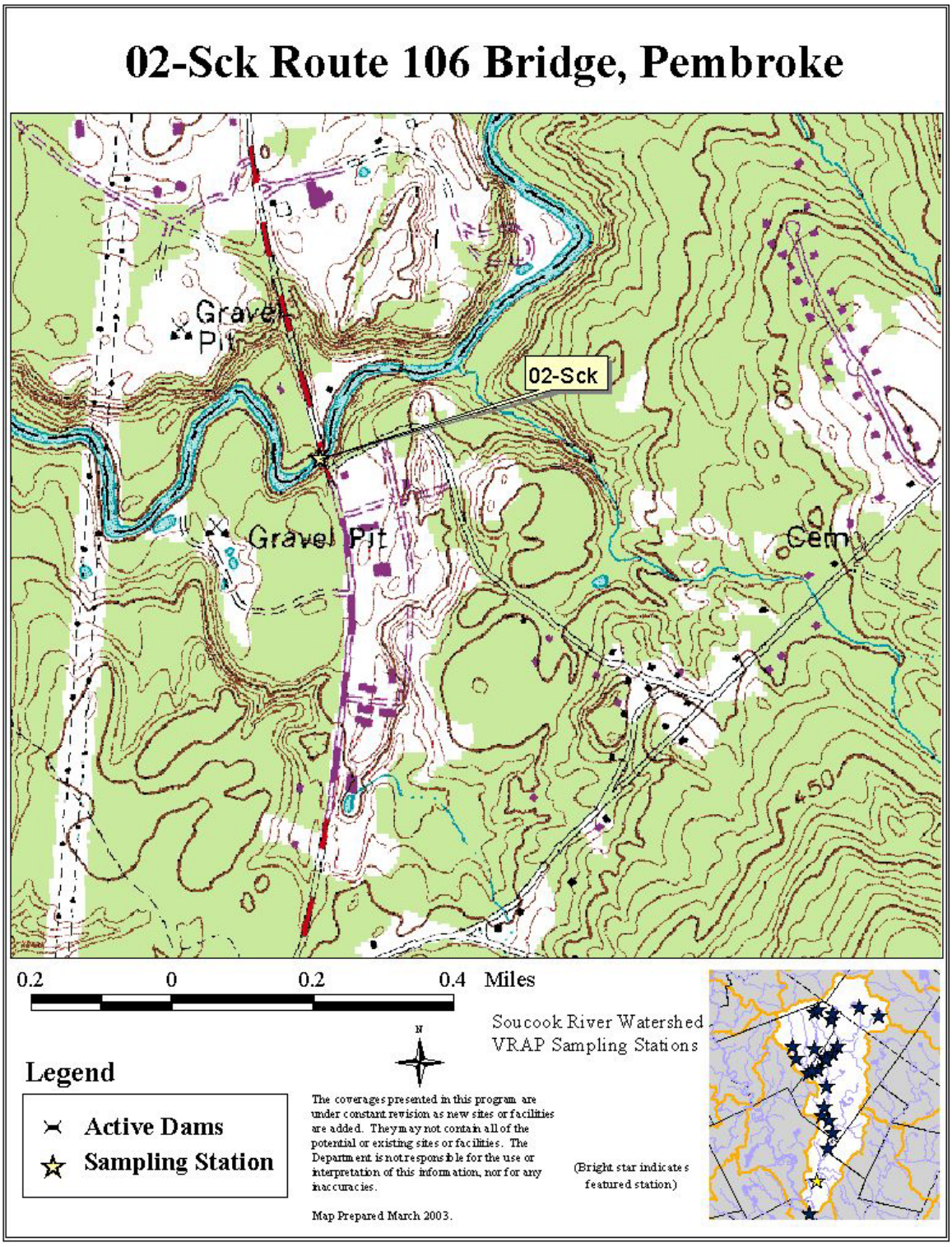
- *pH*: Volunteers can help determine if this location in the river meets the pH standard by providing DES with additional water quality data and information about the influences affecting water quality at this site. This process is not completed in the short term because of the variability of water quality and the organization of volunteers involved. Volunteers may choose to plan one of the following phases each year, and contribute their observations and results to DES:

  Phase I:
  As a first response to low pH measurements, volunteers can investigate the immediate drainage area to determine patterns of runoff and flow. Are there wetlands in the area that are potentially influencing water quality at this location? A simple way to answer this question would be to walk around the area looking for wetland drainage upstream from the site. Topographic and Geographic Information Systems (GIS) maps may also provide useful information about drainage patterns in the immediate watershed area.

  Phase II:
  If wetland drainage is present, the next step is to sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen*: Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.22. 02-Sck: Route 106 Bridge, Loudon, NH



4.22.1. Results and Discussion

Seven measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 22). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. One measurement for DO % saturation was lower than 75%, but this does not necessarily indicate a DO problem.

Table22. Monitoring Summary: 02-Sck. VRAP, 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	7	7	0	7.83 - 10.73	**>5**
DO (% sat.)	7	7	1	70.6 - 123.0	**>75**
pH (Std. Units)	7	7	0	6.52 - 6.92	**6.5-8.0**
Turbidity (NTU)	7	7	0	0.95 - 1.7	**<10 above background**
Conductivity (μmho/cm)	7	7	NA	68 - 172.8	**NA**

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.22.1.1. Dissolved Oxygen

Figure 20 shows dissolved oxygen concentration and water temperature during 1999. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % sat. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. Therefore, additional DO saturation data collected at this location are needed.

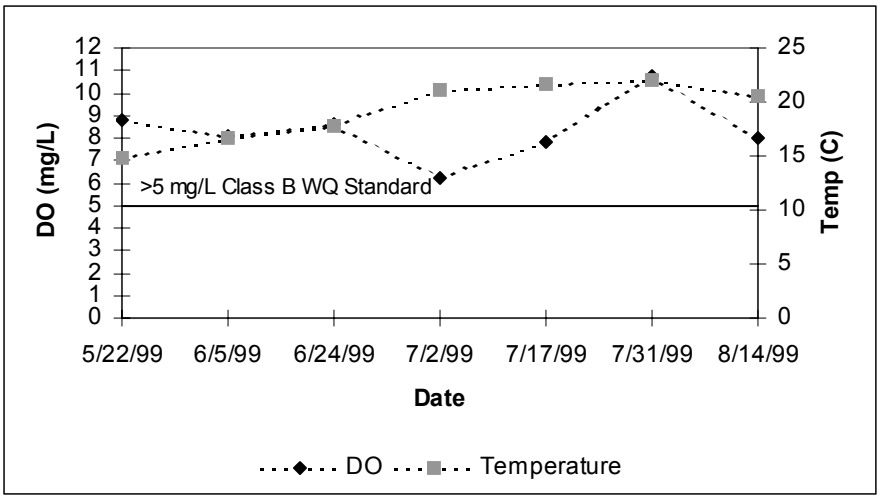


Figure 20. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 02-Sck, Route 106 Bridge, Loudon, NH. VRAP, 1999.

4.22.1.2. pH

The pH at this location, ranging from 6.52 to 6.92 and was not in violation of water quality standards on any occasion. Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.22.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

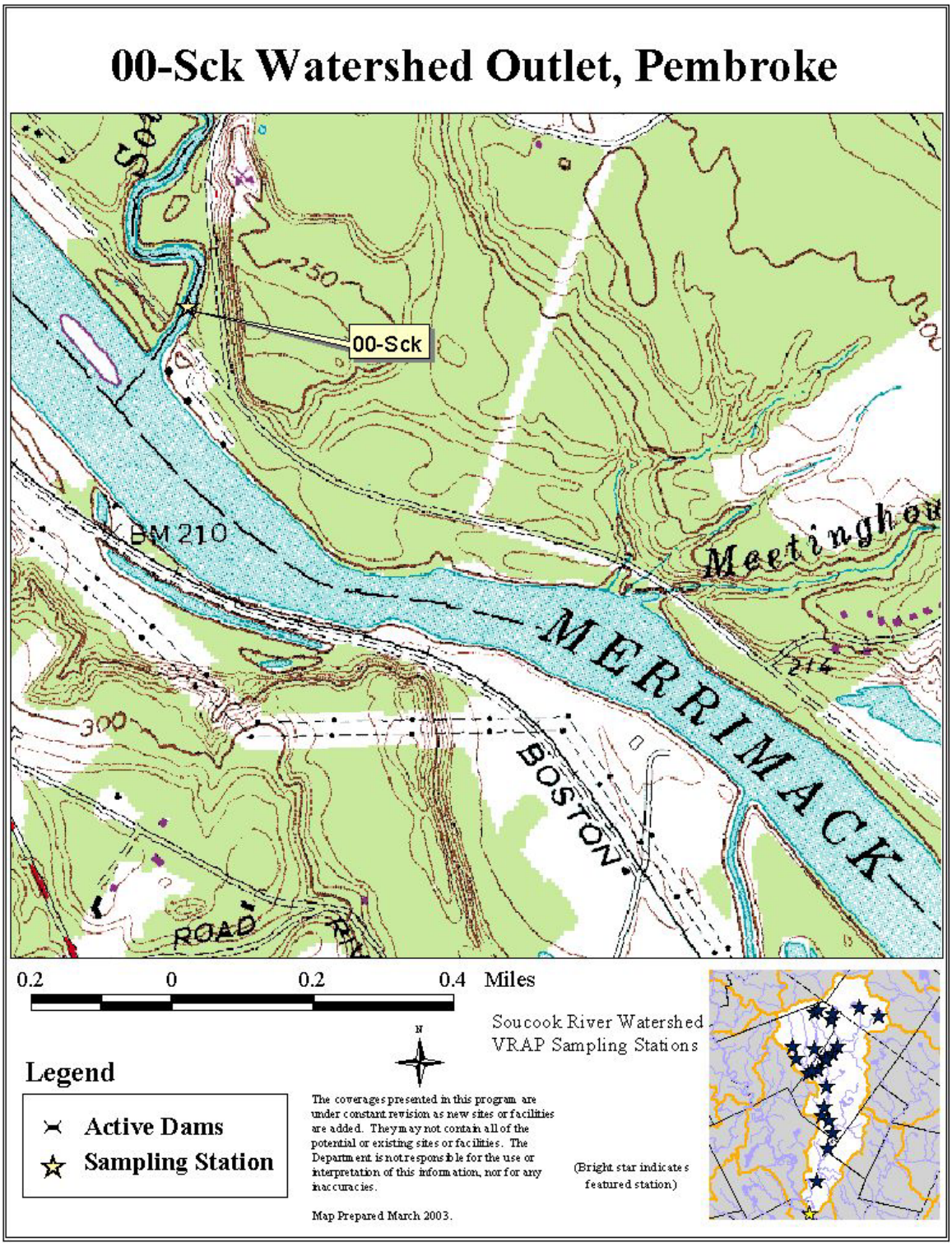
  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station

- *pH*: If wetland drainage is present, sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will

help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

4.23. 00-Sck: Watershed Outlet, Pembroke, NH



4.23.1. Results and Discussion

Seven measurements were made in the field for dissolved oxygen (DO), pH, turbidity, and conductivity using handheld meters (Table 23). All measurements and samples met the Quality Assurance and Quality Control (QA/QC) requirements. One measurement for DO % saturation was lower than 75%, but this does not necessarily indicate a DO problem.

Table 23. Monitoring Summary: 00-Sck. VRAP, Year 1999.

Parameter	Samples Collected	Samples Meeting QA/QC Requirements	Acceptable Samples Not Meeting State Criteria	Data Range	Standards*
DO (mg/L)	7	7	0	6.38 - 10.51	>5
DO (% sat.)	7	7	1	72.8 - 122.2	>75
pH (Std. Units)	7	7	0	6.64 - 6.89	6.5-8.0
Turbidity (NTU)	7	7	0	0.95 - 2.2	<10 above background
Conductivity (µmho/cm)	7	7	NA	70 - 160	NA

***Abbreviated standard values have been used in this table for quick reference. Please see Env-Ws 1700 and RSA 485-A:8 for complete Surface Water Quality Regulations.**

4.23.1.1. Dissolved Oxygen

Figure 21 shows dissolved oxygen concentration and water temperature during 1999. The Class B New Hampshire surface water quality standards for DO include a minimum concentration of 5.0 mg/L **and** a minimum daily average of 75 % sat. In other words, there are criteria for both concentration and saturation that must be met before the river can be considered as meeting DO standards. Therefore, additional DO saturation data collected at this location are needed.

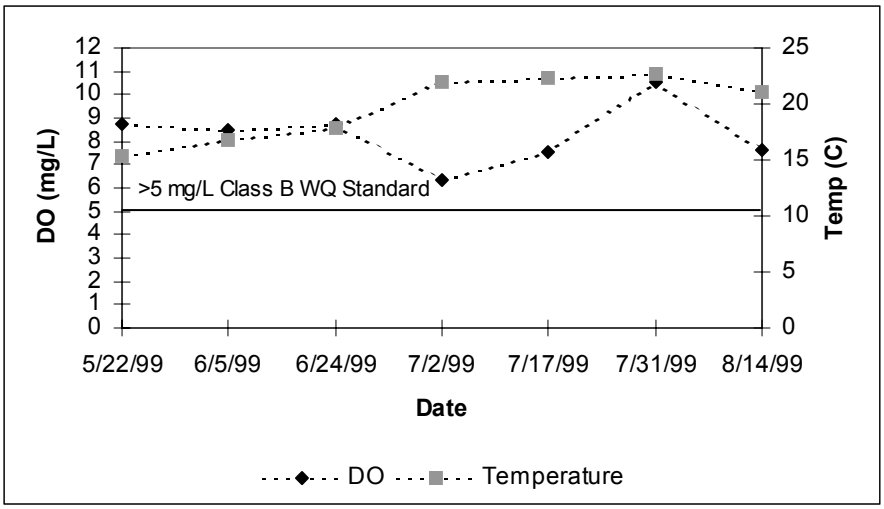


Figure 21. Dissolved Oxygen (DO) Concentration vs. Temperature. Soucook River at 00-Sck, Watershed Outlet, Pembroke, NH. VRAP, 1999.

4.23.1.2. pH

The pH at this location, ranging from 6.64 to 6.89 and was not in violation of water quality standards on any occasion. The precision of the VRAP pH meters (+/- 0.02) requires that results within 0.02 of the standard range (6.5 to 8.0) are not considered out of range. For example, a reading of 6.48 is considered within range, while a reading of 6.47 falls below the standard range.

Station conditions are considered along with pH measurements because of the narrative portion of the pH standard. If the sampling location is influenced by natural conditions, low pH measurements are not considered a violation of water quality standards. RSA 485-A:8 states that pH of Class B waters *shall be between 6.5 and 8.0, except when due to natural causes*. The pH of surface waters can be affected by soil, subsurface bedrock, and wetlands near the river or stream. In addition, rain and snow falling in New Hampshire is relatively acidic, which can also affect pH levels. Additional sampling is needed at this station.

4.23.2. Recommendations

- *Baseline Monitoring*: Volunteers are encouraged to continue sampling for all parameters, especially DO and pH, at this station. More information in the baseline data set will allow for a better understanding of the variations that the river encounters during the year. In addition, this will allow for better documentation of water quality, as related to New Hampshire surface water quality standards.

  For an increased understanding of water quality conditions at the time of sampling, volunteers should remember to be specific about the weather conditions and other characteristics of the sampling station

- *pH*: If wetland drainage is present, sample upstream from the wetland's influence, if possible. Volunteers sampling upstream from a wetland may discover that pH is within the standard range, and that it is likely that the wetland itself is contributing to low pH in the river. If the pH remains low upstream from an influencing wetland it is possible that there is another source of acidity, and volunteer investigations should continue upstream. Continued investigations will help document possible influences, which can be incorporated into the assessment of water quality conditions.

- *Dissolved Oxygen***:** Measurements should continually be made at this station on a routine basis. This will help document variations in the river. As previously stated, there are criteria for both concentration **and** saturation that must be met before the river can be considered as meeting DO standards. Volunteers are encouraged to measure DO in the early morning and during the mid-afternoon hours. This could be done by using a Hydrolab® DataSonde 4a multiprobe, which is an instrument that can collect data at specific time intervals (e.g., every 1-hour). The instrument can be put in the stream and left alone for a period of several days. The use of this instrument is dependent upon availability, and requires coordination with DES.

Appendix A:

Soucook River VRAP 1999
Monitoring Stations

Appendix B:

Soucook River VRAP 1999
Monitoring Results

Appendix C:

VRAP 1999 Parameter Descriptions and NH Surface Water Quality Standards

Appendix D:

VRAP 1999 Soucook River Graphs

Appendix E:

VRAP 1999 Field Sampling Protocols